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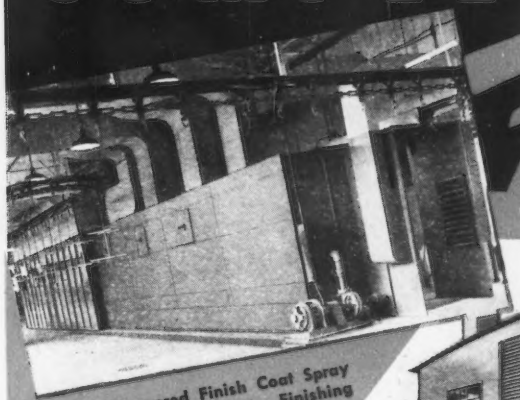

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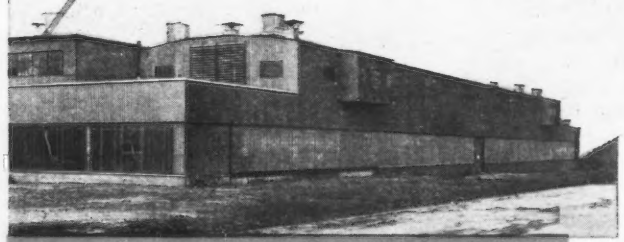

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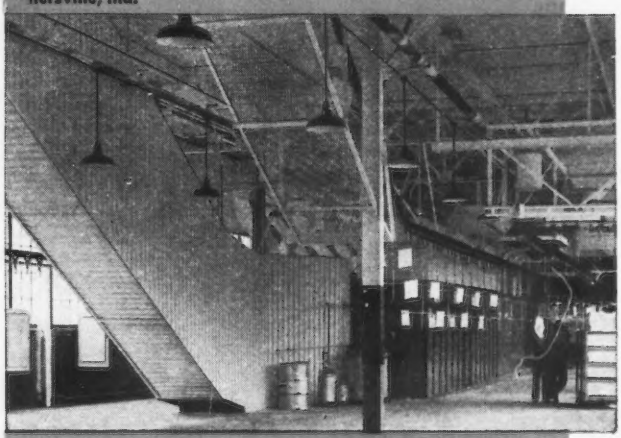

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Long Live the King

"THE King is dead, long live the King." As old 1946 shuffles off in a haze of bewilderment, young 1947 is here with his promise of good things to come—so it has been each new year since time's beginning.

The psychologists probably cook up some high-falutin explanations in terms of compensations and fixations for the contempt leveled at a dead year along with the adoring welcome accorded the rosy-cheeked infant in swaddling clothes. Or maybe it's just one of those basic human urges common to all men—something to do with the deadness and defeat of winter along with the promise of spring and new life in the offing. But, even though it may all be a little phony, there's no denying the stimulation, the heady lift in shedding some of the old misdeeds and mistakes, and emotionally washing the slate clean—then with high purchase and renewed resolution reaching once more for the life that could be.

The life that has been and could be is reflected in and dependent upon the energy and purpose of the great basic metals industry served by THE IRON AGE. Each year for the past 92 years, this annual review issue has probed and peered at past statistics and developments and flicked tentative and cautious glances at what the new year may hold.

Some stories measure the ebb and flow in cold statistical terms—the production of steel, the price of lead, the exports of machinery, etc. Some stories examine the promise of technological improvements—a squirt of oxygen here, a doubling of mill speed there, a deep-drawing innovation somewhere else. Other stories probe that murky never-never land of human values and labor relations. The influence and ramifications of political and economic policies are given a once-over lightly. And, the humbling effect of scientists hurling artificial meteorites into outer space and cooking with split atoms must naturally give rise to tentative appraisal of overriding influences that could well wrench economic-political practices and ethical conducts into new patterns.

With intelligent will, tolerance and honesty of purpose, all these factors are the building blocks to build the good times of the golden years. The structure won't rise in 1947, for progress is a matter of inching ahead. Maybe a good inching song would help liven the step and straighten the spine, and what could be better than—

"Year ain't been the very best
Purty hard by trouble pressed
But the rough way leads to rest—
Here's hopin'!"

T. W. Lippert

The vast resources of the Inland Steel Company are important factors to volume users of steel.

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Activating these resources and modern facilities are Inland's experienced engineers and metallurgists applying their skills to every phase of development, production, and control...making certain that every ton of steel produced is worthy of the name...INLAND!

Yes, Inland has the resources to produce quality steel for you.

HELP! MORE SCRAP NEEDED!

Extra tons of scrap are needed to make the extra tons of steel for American industry. Please keep your scrap moving back to the mills.

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● Inland Steel Company, 38 South Dearborn Street, Chicago 3, Illinois. Sales Offices: Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Paul, St. Louis.

PRINCIPAL PRODUCTS: BARS • STRUCTURALS • PLATES • SHEETS • STRIP • TIN PLATE • FLOOR PLATE • PILING • REINFORCING BARS • RAILS • TRACK ACCESSORIES

► Had it not been for the steel and coal strikes in 1946, the industry would probably have produced 81 to 83 million tons of steel ingots. Thus the strikes cost the nation about 16 million tons. The year 1947 opens with the industry in a position to produce about 80 million tons, but spiraling wages and prices may cause some order cancellations later this year.

► The worldwide shortages of lead, copper, antimony, cadmium and tin are likely to lead to further price increases in some of these metals before there is a leveling off and decline to more normal competitive price relationships.

► The big issue in railroading is no longer the battle of diesel v. steam but rather of coal v. oil as the fuel of the future.

► An IRON AGE survey shows that labor productivity, or manhour output, is still below the prewar level but there are indications that it is gradually improving. Of 683 metalworking plants reporting, 20 pct said productivity was higher than it was before the war, 37 pct said it was about the same and 43 pct reported it lower.

► A new low alloy high strength steel containing less than 2 pct of any alloying element possesses remarkable strength and impact qualities. Some properties obtained from this steel in the hardened and tempered at 450°F condition are: Tensile strength—240,000 psi; yield strength (0.2 offset) —195,000 psi; elongation (in 2 in.) —12.5 pct; and reduction of area —45 pct. The Izod impact strength is 31 ft-lb, tested at 70°F; and 29 ft-lb, tested at -100°F. Although still in the development stage, the properties listed have been duplicated with a commercial heat.

► The policy of requiring foreign buyers to pay for American goods in gold has cost us over $10 billion since 1934 and we now have approximately 55 pct of the world's visible gold supply. This trend can not continue at its present rate without jeopardizing not only our economy but the American way of life.

► Development of automatic, electronically controlled resistance welders has progressed to the point where scores of welds can be made in a single pass. The use of such equipment for progressive line production is anticipated soon.

► The foreign steel industry is becoming an economic hodgepodge as governments commit themselves to heavy capital investments in steel construction. Once the politicians start construction there is no about face, regardless of the outcome.

► Builders of standard machine tools are incorporating into their postwar models many features such as automatic cycling and electronic controls previously found only on special purpose automatic machines. The increased productivity of the new equipment is expected to go far toward offsetting the low price of older machines available in WAA surplus.

► The tightened supply situation in the automobile industry may have a silver lining—it may force standardization. Fisher Body has been narrowing down its spring list which once contained more than 100 types of springs. This process, which included engineering changes in seat construction, has greatly simplified the spring supply problem at Fisher.

► An expert on Mesabi iron ore reserves estimates that about 150 million tons of direct shipping ore, partly open pit, partly underground, have not yet been discovered. A similar tonnage of concentrates may be obtained from wash ores which have not yet been developed and listed as reserves. The Mesabi range has a normal life expectancy of three or four more decades, after which there will be a gradual decline over a 30 or 40-yr period.

► Shipbreaking is expected to yield a million tons of scrap a year for at least 5 yr. The industry is growing by leaps and bounds and soon there may be as many as 40 companies involved in shipbreaking. Ship scrap yield to date has only been about 220,000 tons but operations should reach a yield of about 80,000 tons a month by next October.

► Use of nickel oxide, either as part of the charge in electric furnaces or added while the melter is using a reducing slag, permits production of 18-8 stainless with carbon limited to 0.03 max. The low carbon content reduces susceptibility to intergranular corrosion to the extent that stabilizing with titanium or columbium is not required.

► Postwar annual tin consumption, fantastically high in some estimates, is expected to approximate 125,000 to 150,000 tons when normal productive capacity is reestablished. Expanded production of electrolytic tinplate with its lighter tin deposits is a large factor in the postwar tin consumption picture.

► The use of higher compression ratios, higher octane gasoline, alcohol and specially blended fuels seems well established as a trend in the automobile industry. Of all the engineering changes most likely to be adopted by the industry, new designs for transmissions and springing appear to occupy the No. 1 and No. 2 positions.

What's in this

Steel-1946-'47

A pithy summary of the accomplishments and difficulties of the steel industry in 1946 is presented in this article. Likely trends in wages and production are discussed. Page 66.

Economics and Business

Touching on two aims vital to continued prosperity in a free enterprise--international peace and domestic prosperity,--the author of the Ruml Plan proposes a series of practical steps which, if adopted will go far in achieving these twin goals. Page 76.

Steel Consumption by States

A new survey of steel consumption to determine the pattern of steel consumption on a state by state basis is reported in this article. The results show that four states alone account for more than 56 pct of all steel received in 1946 by metalworking plants. Page 72.

World Steel Output

Efforts of Europe to rebuild its steel industry, and an outline of the developing trend toward nationalization of such facilities are given in this first hand report from London. Steel and pig iron output of all producing countries are also given. Page 88.

Foreign Trade

Assuming new importance in view of recent international developments, some changes may be necessary in American foreign trade policies, according to this article. Practical correctives are offered for the present unbalance in our over seas trading. Page 82.

Labor Productivity

In an effort to clear away some of the confusion surrounding labor productivity, a survey was conducted to determine productivity levels in metal working plants. Page 110.

Metallurgy

Reshaping of wartime metallurgical developments to fit civilian needs has resulted in many important new techniques being made available to metalworking plants. This article discusses many of these important advances. Page 96.

Nonferrous Metals

Prices and production of nonferrous metals in 1946 followed an erratic course. Foreign markets and decontrolled domestic prices injected many uncertainties into the market. This article discusses some of the factors underlying the markets and appraises the likely future trends. Page 104.

Scrap Steel

Still one of the scarcest commodities, and with little hope for plentiful supplies in the near future, this article explores factors affecting scrap supplies and describes steps being taken to tide the steel industry over the immediate tightness. A calendar of significant happenings in the scrap market is an added feature. Page 134.

s Issue..

e and Coal

A factual, common sense report of the condition of the nation's iron ore reserves, highlighting the intensive study being given methods of beneficiating low grade deposits, is contained in this article. The outlook for the troubled coal industry is also discussed. Page 126.

U.S. Stockpiles

What materials go into the government stockpiles, how they are acquired and how industry may make use of them in emergencies. Page 116.

Auto Industry

With millions of people still looking for that postwar car, this article tells what the industry accomplished in 1946 and what it is planning for the future. A table of steel requirements for the average small car is also included. Page 148.

Railroads

A critical analysis of the problems facing the nation's railroads, stressing especially the need for the roads to take full advantage of latest technical developments to reduce operating costs is given in this article. The case for steam v diesel is summed up. Page 140.

Metal Finishing

A concise and comprehensive review of significant technical developments in the metal finishing field in 1946, together with some comments on current economic and labor problems of the industry are given in this article. Page 160.

Welding

Significant developments in all phases of welding in 1946, together with likely trend of future equipment designs, and new markets for welding equipment are discussed in this article. Page 166.

Machine Tools

A study of machine tool prospects in peacetime competition, with particular emphasis on efforts of the industry to establish new buying interest through improvement of its products, is given in this article. Page 154.

West Coast

A report on the present status of the industrialization of the West Coast, with particular emphasis on new and enlarged steel making and rolling facilities, is presented in this article. Page 120.

10,000 Trade Names

A new directory of some 10,000 trades has been compiled by THE IRON AGE as a ready reference for engineers and business executives. It tells in simple alphabetical form what kind of material or process the trade name covers, where it can be used and who makes it. Page 172.

Statistics Prices and Production

Here, in easy-to-read tabular form, are the latest statistics on prices and production of all major iron and steel products, including iron ore, coke and scrap. Nonferrous metal products are also covered. Page 176.

Weekly Market News

The regular weekly news and market reports of the metal industry, including scrap steel markets, machine tool business reports, personals, nonferrous markets and various regional reports, are given beginning on page 180. The weekly summary and ingot rate appear on pages 200 and 201.

STEEL – 1946-47

Peace, peace and yet there is no peace, well describes the steel industry in 1946. Heckled by steel-starved customers on one hand and belabored on the other by unions, and at the same time struggling with numerous raw material shortages, the industry recorded an unspectacular year production-wise. With some 16 million tons of production lost through strikes, and with prices and wages still moving higher, it appeared to many observers that management and labor were fast entering a period wherein the law of diminishing returns might well work to the disadvantage of both.

By TOM CAMPBELL
News-Markets Editor
THE IRON AGE

REGARDLESS of whether or not they realize the full significance of it, steel labor and steel management have entered a period wherein the law of diminishing returns is definitely operating against both. The wage increase which the steel union will wring from steel firms this year and the prices which must be raised to partially offset the resultant increase in steelmaking costs may set in motion a chain of events which will eventually cost both groups far more than they expect in lost wages and lost production.

Because users of steel have never been able to get enough material to set up a production schedule that would in no way satisfy demands made upon them there has been a disposition to pay any price, submit to any conditions or to take something other than what was wanted in order to keep plants in operation and skilled workmen on the payroll. This will not always be the case. The cost of steel is a universal gage in pricing items into which steel goes. It has always been this way and most firms utilizing steel use a formula to establish their prices, the base of which is the net price paid for steel.

Wage-Price Relationship

Steel wages have almost the same relationship to other wages as steel prices do to items made from steel. This was well demonstrated when early in 1946 the increase in steel wages and in steel prices caused a breakthrough in the "hold the line" policy. This action formed a pattern for other industries and the gains made by steel labor were shortlived. No single group can obtain wage advantages for long when other groups are well organized and can demand similar concessions. The same general condition applied to steel management. When the price of steel was increased this set off a wave of prices in other fields with the result that the cost of making steel went up again due to higher material and equipment prices.

Steel industry and labor are now ready to repeat the whole process which brought such little return to labor and management in 1946. The two groups stand a good chance of making a start at real collective bargaining, but the cards seemed stacked against both. Labor is scared stiff of rising prices (which reminds one of a dog chasing its tail, since rising wages are part of the reason for the hike in living costs). Management, seeing for the first time a chance to make bigger profits, is up to its ears in figuring out how to do this and still meet labor's demands—the tail chasing all over again—since higher prices are also part of the rise in the cost of living.

Days, months and years have been spent in arguing which came first to start inflation—higher wages or higher prices. Such argument offers little or no answer to today's labor conditions. Union leaders, such as Philip Murray and John L. Lewis, have been through periods when labor saw high living costs with wages trailing far behind. Both have also been through periods when the average annual wages made in their respective fields have been little more than a roller now makes in a steel mill in 1 month of high output. It is the memory of these factors as well as the need of labor leaders to have a rallying point to keep the union from falling apart, which has caused and will cause a string of demands as long as the business curve shows signs of moving upward.

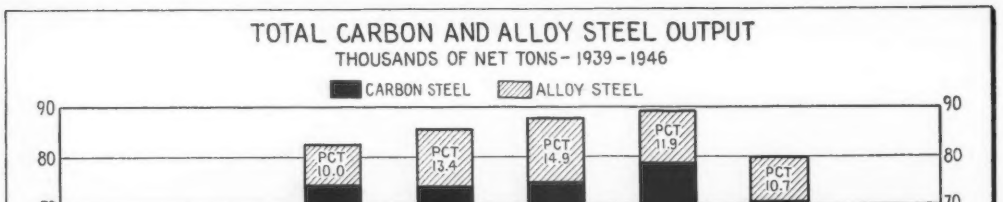
If conditions in 1947 follow the pattern of 1946, the long awaited and long debated period of 4 to 5 lush years may never come, or before it does show its tardy head, both labor and business will take a drubbing at the hands of those who make or break prosperity for both—the public. Already many would-be consumers have given up buying that treasured dream —either because they have found they can now get along without it or because when they pay their bills they have little or nothing left over. Another year with from 14 to 16 million tons of steel lost because of steel and coal strikes would so upset the system of distribution in the United States that a complete breakdown in the economy of the country might result. Most steel leaders know this and so do intelligent labor leaders. Both, however, are so driven by the immediate demands of their respective groups that it is hardly likely that either will be able to do anything in 1947 except the obvious—the union holding out for higher wages with a threat of strikes and business heads raising prices to make up for wage increases which they will give only to keep the wheels of production going.

Endless Wage-Price Spiral

The much berated individualists who have said that labor and capital must fight it out on all fronts, if we are to have an end to the endless wage price spirals have something in their favor. The question would be settled but the country might not get over it for a long time. Some serious thinkers believe that even that would be a good solution for they argue that to go on as we are will only lead to a depression which will outstrip the last one and at the same time bring a definite end to the so-called American Way.

The only major reason why labor and business do not slug it out is probably because there are enough industrialists who know that were management to gain a clear cut victory it would be taken as a sign to revert to the "good old days"—and because there are some labor leaders who believe that the gains already made should be retained rather than lost in such a fight which, according to history, would not necessarily result in a labor victory.

Any attempt to indicate that labor relations are not again the major theme in 1947 is akin to burying one's head in the sand. The disastrous results of three major strikes—steel, coal and electrical equipment—in 1946 are still apparent. Not only has the country



failed to keep up with demand on the home front but a large segment of the population has suffered so long from strike fear neurosis that a part of it is immuned to expressing shock or indignation. This state has so affected workers that productivity is far from what it should be, and the day when a man or woman did a good day's work seems to have been replaced by the feeling that if one reports for work the obligation has been fulfilled.

All efforts of economists and management to portray the fact that real wages are the ones which pay the bills failed of their purpose in 1946. No attempt to show that higher wages followed by higher prices meant a static condition, or even a loss in real wages, was successful. The suspicion of the average workman towards his company and towards economists in general is as strong as it ever was. The workmen feel that to get an increase in actual money is better than taking a chance that if they don't get it prices will not go up.

The numerous strikes which have occurred with monotonous regularity in the past year have, in one way, contributed to inflation by cutting down the production of goods. The settlement of these strikes which has always resulted in healthy wage increases and higher prices has laid the groundwork for the inflation which all seem to fear but do little about. It may be, however, that prices in 1947 will go too high to support a normal high business cycle with the result that a severe testing of all prices, especially steel, is in store before the year it out.

Three or four good months of steel operations at close to 90 pct of capacity, with some increase in worker productivity, either by better management or by greater worker output, would clean up the excess demand which has been hanging over the steel market since the war ended. By that time it would be seen whether the industry can operate at high rates continuously and whether the consumer demand which has been on paper for some time actually exists in fact or in the minds of the market experts. This much needed test cannot be made, however, if the steel industry in particular must go through a wage-demand-strike-wage-increase-price-increase cycle every year. For that reason alone it must yet be proved that "prosperity is just around the corner."

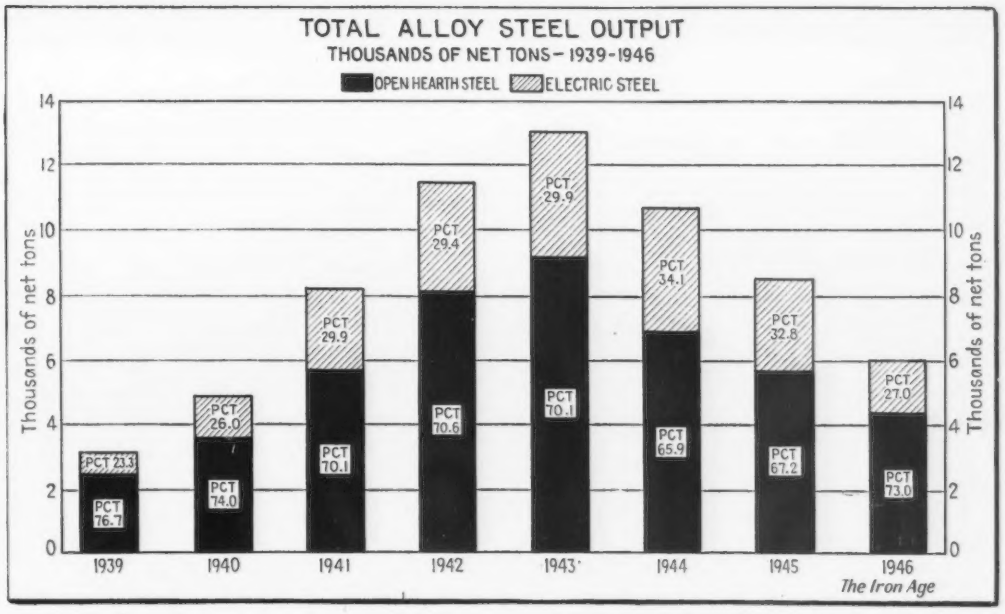
Throughout 1946 steelmakers had huge carryovers from one month to the next representing material which at one time or another had been promised for shipment but which was delayed because of the unprecedented steel demand or because of shutdowns caused by strikes. In most cases the steel strike which shut down practically all steel plants during part of January and February in 1946, extended deliveries on firm orders as much as 1½ to 2½ months. The subsequent coal strike during April and May further complicated the delivery picture, so that by July most steel companies were still far behind on their original delivery promises.

During the time in which it was almost impossible to obtain sufficient amounts of steel to support an economical production cycle in manufacturing plants, many of the latter were forced to pick up material at prices somewhat greater than mill quotations. In many instances material was obtained at warehouse prices. In other cases a small segment of manufacturing industries went into the black market and purchased material at prices ranging from three to four times unable to obtain the specific material required, elected the legitimate quotations. Still other industrialists, to buy other types of steel which, although serving the purpose, were somewhat more expensive.

Probably at no other time in manufacturing history has a user of steel been more harassed than during 1946. While steel producers were having their difficulties shutting down and starting up furnaces, manufacturing concerns were attempting to maintain at least a semblance of manufacturing and at the same time retain skilled workmen on the payroll. The hysteria which prevailed in the early part of 1946 with regard to placing orders for as much steel as possible, regardless of the type of products, soon brought about one of the worst unbalanced inventory conditions on record.

The pricing system in the steel industry, which was under control of OPA during most of 1946, was responsible for practically all steel companies stepping up production of those items on which the return was the greatest and reducing output on those products which showed little or no profit. Consequently, with an unbridled steel order situation most consumers accepted any and all types of steel. Unfortunately for the manufacturers the actual production cycle in their plants was set by the quantity of the most "hard to get" item. This left a considerable unbalance with respect to those products which consumers had obtained without regard to subsequent use.

Throughout this frenzied buying, or rather attempt-



ed buying, practically all steel companies carried through a very elaborate so-called quota system. Under this setup major steel companies minutely studied the sales experience of their customers during 1939 or 1940. As far as possible old customers were given a percentage of available finished steel somewhat similar to that which they obtained during those prewar years.

In those instances where new industries had sprung up during the war or where old ones had expanded facilities far beyond what they were before the war, many hardship cases resulted. An attempt was made by the Civilian Production Administration to direct tonnage in real distress cases, and a similar attempt was made to direct tonnage to those manufacturers who were working on what was considered, more or less, priority jobs. On paper this type of assistance looked fairly good, but in actual practice it only served, at least during the third quarter of 1946, to further complicate the steel distribution picture.

Toward the end of 1946 most steel firms found order books overloaded with business, shipment of which was impossible before the end of the year. Many of these bookings represented duplicate tonnage and also tonnage which no longer would meet the conditions of the buyer. For this reason many major steel companies asked their customers to make a complete study of the orders which they had on steel mill books and further asked that most of them be canceled and reordered with more detail and better specifications, all of which was to represent orders against 1947 quotas which steel companies were setting up for the first quarter of that year.

In practically all cases the cooperation between steel companies and their customers was exceptionally good. It made little difference whether steel companies canceled the tonnage or whether the customer did this himself. The net result of this important action was to squeeze the water out of inflated order books and put the latter on a more practical basis.

At the present time it appears that steel companies will continue the quota system throughout 1947 and any orders received from consumers will have to be matched against the quota which the mill has indicated for that consumer. With year-end inventories being taken by steel consumers, the shock of the size of such inventories as well as the unbalance may cause a temporary decline in steel ordering during the early part of this year.

While most steel consumers have kept a fairly good check on inventories, the fact that these have been more unbalanced than at any time since the period following World War I, a far more cautious attitude among purchasing agents may develop which may linger for many months in the early part of 1947. Most emphasis by steel consumers during the first half of this year will be placed on bringing the volume of short steel items more nearly in line with the volume of those products which have shown the greater unbalance on the high side.

One factor which is expected to produce a far more normal type of steel purchasing in 1947 is the fact that since steel price increases may come at any time and because steel shipments carry a price "at time of shipment," there is little incentive for too much forward buying. In the present sellers' market there is no practical hedge for the steel user against higher steel prices.

Following long conferences with OPA during the latter half of 1945 and the first quarter of 1946, the steel industry was able to obtain an average increase in steel products amounting to $5 a ton. Most of this, however, was supposed to be compensation for the 18½¢ an hr wage increase granted in February, 1946. The steel industry through its spokesmen and through their negotiations with the OPA had insisted that a price increase was due before the wage increase and that any wage increase should be taken care of by an additional price revision.

This argument made little impression on OPA. Even after the allocation of the average $5 a ton advance, among the products which needed increases the most, the industry claimed the amount allowed by OPA was insufficient. Because of this attitude further studies which the industry hoped would lead to additional price increases were begun, but before they were completed steel price controls were eliminated. It is important to note that the pricing policy dictated by OPA during 1946 had much to do with the extreme shortage of certain steel products. With return on these at a low point, it would have been foolish to expect steel companies during a peacetime period to cut down on the output of profitable items and step up their production of low profit items—especially in view of rising material and labor costs.

During the closing months of 1946 most steel companies started raising prices on those products which they claim were out of line with actual cost. In most instances the more important revisions involved a change upward in the extra charges. The upward

TABLE I

Production of Iron and Steel, by Product (1939-1946)

(In Thousands of Net Tons and Pct of Total)

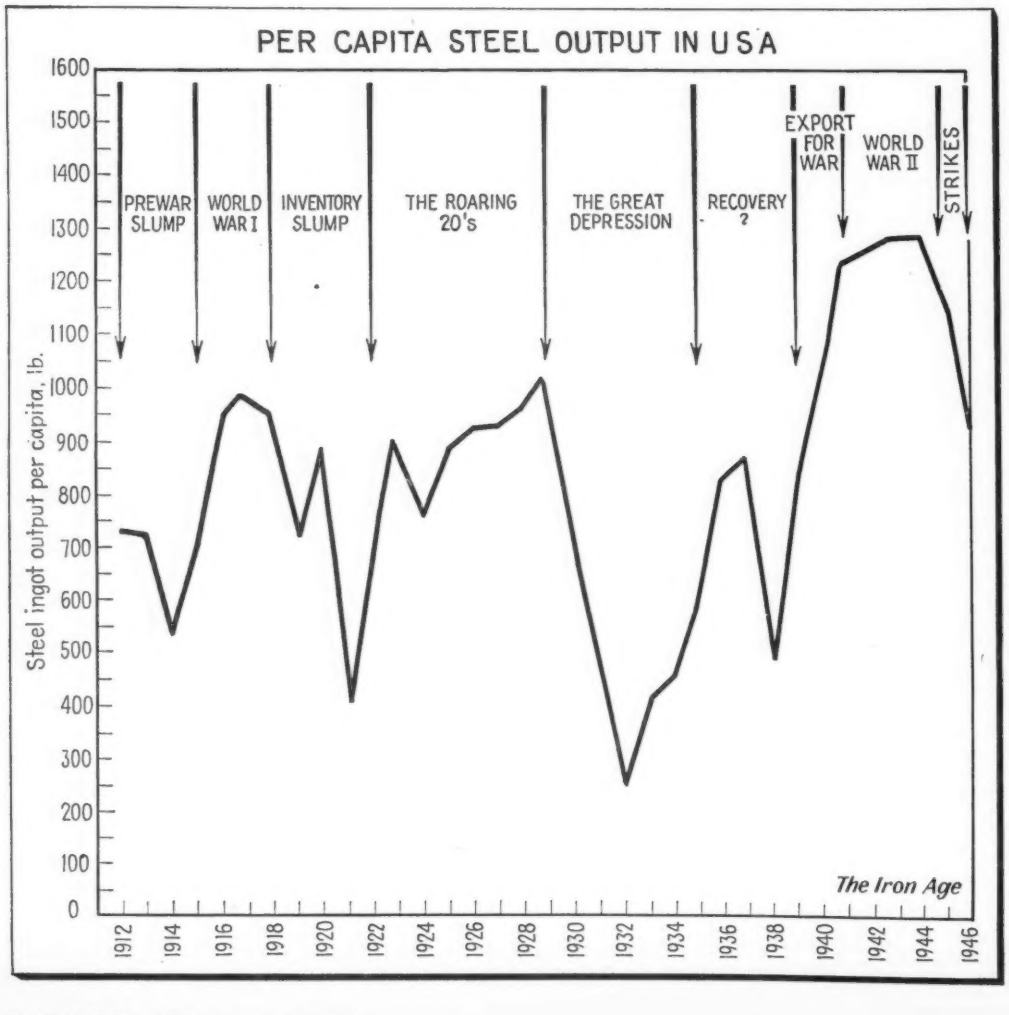
Year	Plates		Sheets and Strip		Shapes		Bars		Pipe and Tubes, Skelp and Billets		Wire and Wire Products, Wire Rods		Tin Mill Products		Rails, Wheels, Axles, Tie Plates		All Other	Total Production
	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Pct of Total	Tons	Net Tons
1939	3,102	7.9	11,859	30.4	3,359	8.6	6,138	15.7	4,349	11.1	3,680	9.4	3,468	8.9	1,995	5.1	1,117	39,068
1940	4,323	8.9	13,784	28.4	4,232	8.7	7,885	16.4	5,030	10.5	4,352	9.1	3,626	7.5	2,399	5.0	3,029	48,660
1941	6,200	9.9	16,143	25.9	5,725	9.2	10,979	17.6	6,583	10.6	5,268	8.5	4,819	7.7	2,962	4.8	3,646	62,324
1942	11,800	18.8	11,248	18.1	5,969	9.6	11,940	19.2	5,940	9.5	4,632	7.4	3,520	5.7	3,090	5.0	4,307	62,446
1943	12,900	20.2	10,899	17.0	3,758	5.8	12,005	18.7	5,861	9.1	4,385	6.8	2,324	3.6	3,184	5.0	8,086	63,400
1944	12,457	19.5	12,259	19.2	3,978	6.2	11,109	17.4	6,294	9.9	4,522	7.1	3,262	5.1	3,985	6.2	5,980	63,846
1945	6,508	11.6	13,600	23.9	3,700	6.5	10,048	17.7	6,755	11.9	4,014	7.0	3,650	6.4	3,821	6.7	4,500	56,598
1946	4,002	8.5	13,605	28.9	3,598	7.6	8,878	18.8	4,921	10.4	3,760	8.0	3,371	7.2	3,012	6.4	1,953	47,100

movement in the base prices of flat-rolled products and hot-rolled bars ran somewhere between $1 and $2 a ton, with some items having been advanced $3 a ton.

In those instances, however, extra changes were made which meant that steel users during the latter part of 1946 were paying from $3 to $5 a ton more for certain flat-rolled products. Railroads were faced at about the same time with higher prices for rails and track accessories. Rails were advanced as much as $6.61 a net ton, while many accessories were boosted from $3 to $5 a ton. Steel firms did not consider these price advances as a general increase, but insisted upon calling them revisions, which they claim were long overdue.

It is certain that if the steel union obtains even a moderate increase in wages and some of its social security demands, these concessions will be followed by a general increase in the steel price structure. In all likelihood when this action takes place most steel companies will complete the task of restoring the natural relationship between the prices of various steel items which was distorted under governmental price control.

Despite the difficulties under which the steel indus-



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THE steel and coal strikes in 1946 brought about a substantial drop in the per capita production of steel ingots. In 1945 because of high war output per capita production of steel ingot was still in the high levels of 1143 lb per person. For the year 1946 the drop in ingot output and the rise in population brought the per capita output of steel down to 928 lb per person. If there are no strikes in 1947 the trend will move up again but will not reach the peak made in 1944.

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TABLE II

Steel Distribution by Consuming Industries (1939-46)

(In Thousands of Net Tons)

	1939		1940		Average 1941-44 Inc.		1945		1946	
	Tons	Pct	Tons	Pct	Tons	Pct	Tons	Pct	Tons	Pct
Agriculture	1,421	3.6	1,630	3.3	1,565	2.4	2,426	4.3	1,645	3.5
Aircraft	.....	.....	51	0.1	5,557	8.8	5,521	9.7	23	0.05
Automotive	5,906	15.1	7,965	16.4					5,994	12.7
Construction & Maintenance	6,100	15.6	6,936	14.3	8,379	13.3	8,353	14.7	7,867	16.8
Containers	2,978	7.6	3,068	6.3	4,216	6.7	4,333	7.6	4,370	9.3
Machinery, Tools	1,460	3.7	2,330	4.8	3,191	5.1	4,739	8.3	3,637	7.8
Oil, Gas, Water, Mining	1,842	4.7	1,900	3.9	2,221	3.5	2,670	4.7	1,950	4.2
Pressing, Forming, Stamping	1,842	4.7	2,296	4.7	2,809	4.5	3,800	6.7	3,100	6.6
Railroads	3,250	8.3	4,019	8.3	5,422	8.6	5,268	9.3	4,300	9.2
Shipbuilding	518	1.3	1,000	2.1	9,657	15.3	3,374	5.9	290	0.6
Exports	2,817	7.2	8,720	17.9	7,701	12.2	3,793	6.7	2,959	6.3
All Others	10,933	28.2	8,745	17.9	12,212	19.4	12,669	22.2	10,733	22.9
TOTAL	39,067	100.0	48,660	100.0	63,490	99.8	56,946	100.0	46,868	100.0

try and its customers labored during 1946, a fair distribution of available finished steel was made during that year—if it is assumed that the distribution during 1939 and 1940 constituted a fair standard. Unfortunately this conclusion refers to total steel received by various consuming groups and does not take into account the unbalance in inventories which resulted from these shipments. By and large, however, those officials in various steel companies whose difficult job it was to see that available steel was doled out under the fairest means possible deserve far more credit than most steel customers are willing to give them.

On a percentage basis the distribution of finished steel during 1946 is quite similar, with but few exceptions, to 1939 or 1940. In the case of steel exports obviously the 1940 figure was exceptionally high compared with a normal total of from 7 or 8 pct. Otherwise comparisons between the distribution in 1946 and that in 1939 and 1940 furnish conclusive proof that a good job was done in 1946 despite strikes, duplication of orders and general scarcity of materials.

In the case of the automotive industry, close to 13 pct of 1946 steel output went to that group as compared to about 15 pct in 1939. This difference is not unusual in view of the fact that automobile production was a halting affair in 1946 and that inventories in that industry are probably more unbalanced than in any other manufacturing group. If automotive concerns receive, as they are likely to, a much greater amount of flat-rolled material in 1947 than they did in 1946, this will serve to balance out inventories. Automotive production in 1947, barring a general steel strike, would then reflect a much greater volume than actual steel shipments would indicate.

According to the statistics in table 2 construction and maintenance took a large part of total 1946 output. It is suspected that one of the reasons why this figure is so high is because a far greater volume of maintenance and repair work was carried out on a greater scale in 1946 than was believed. There seems to be nothing unusual about this when it is recalled that the government, theoretically at least, continued drastic construction curbs during most of 1946.

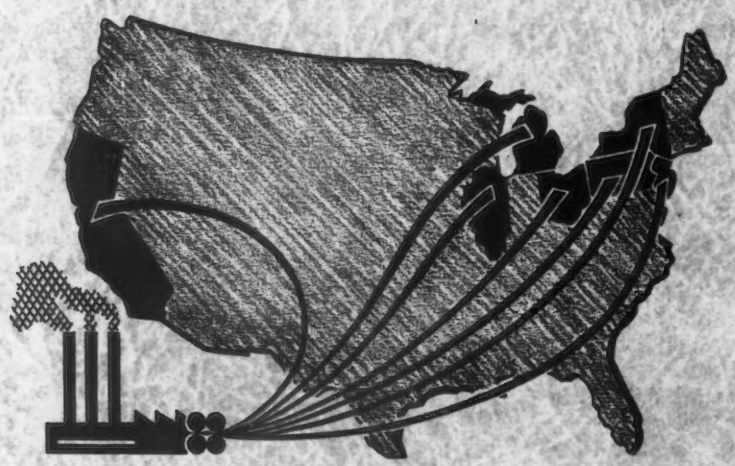
Because of a change in reporting steel consumption figures and because strikes and other difficulties put such reports far behind some original statistical estimating, it was necessary to arrive at steel distribution figures by general consuming industries. American Iron & Steel Institute distribution figures for 1946 were radically changed from those released in previous years and a sincere attempt was made to reconstruct consumption figures by major industries in order not to interrupt the series of statistics produced in previous years. The fact that steel companies hewed close to the line on their quota setup and that the final compilation of steel distribution by consuming industries came very close to that which occurred in 1939 appears to the writer to furnish the sufficient validity for the figures appearing in table 2.

Other charts and tables appearing elsewhere are self-explanatory. An effort has been made to show the prewar period generally accepted by the industry and its customers as well as the war period and the initial postwar years. As far as percentages are concerned, it may be expected that those shown on the various charts and tables for 1946 reflect a pattern which will be changed but little during 1947 and 1948. Obviously the actual tonnage figures will change as steel production moves up or down. In order to rule out the abnormal steel distribution during the war period, an average of the 4 yr, 1941-44, has been made for the record in order to reflect the average war year.

Danger signals to the steel industry which it may or may not be aware of include: Overpricing, which in turn would serve to strengthen the hand of nonferrous products in its competition with special steels; high steel prices, which spell higher prices for all materials made from steel; and finally, the possible inability of the industry to go through a year's uninterrupted production (which could range beyond 83 million tons of ingots) because of a breakdown in practical collective bargaining.

STEEL USE BY STATES

The pattern of the distribution of steel has long been a source of lively interest to metal product manufacturers. A survey conducted by THE IRON AGE to determine the consumption of steel by strictly metalworking plants on a state-by-state basis serves to shed further light on this complex subject. The survey shows that metalworking plants in 1946 received some 28,000,000 tons of rolled steel, with the bulk of the tonnage going to plants in Ohio, Michigan, Illinois, Pennsylvania, New York and California.



By O. L. JOHNSON
Director of Research,
THE IRON AGE

JUDGING by the inquiries received by THE IRON AGE there is a lively interest in the consumption of steel by metalworking plants on a state-by-state basis. This interest stems from two sources. First, a desire on the part of manufacturers of industrial products to know in what proportions steel is consumed by states so that they will have an index to the state locations of their major industrial markets for sales analysis work. These manufacturers consist of companies making all types of metalworking machinery, tools, accessories, parts, materials and equipments which are widely used in the operation of metalworking plants. Second, a desire on the part of manufacturers of consumer metal products to know how much steel is consumed in the various states so that such manufacturers may plan more intelligently for their own plant expansion.

A specific case in point is that of a large manufacturer of consumer metal products who conferred recently with THE IRON AGE on the problem of selecting a site for an additional plant to be built soon. The present plant of this manufacturer is a large one and is favorably located. But further expansion of its present location is not feasible for physical reasons, and the thought occurred that an additional plant in some other state would be advantageous market-wise. Such a step toward decentralization of manufacturing facilities would effect a saving in freight rates by placing the new plant nearer to population concentrations which at present are served through a considerable use of railroad facilities.

In a problem of this sort several factors must be considered. How much steel of the kind required is produced in any area that might be selected? How much steel is consumed by metalworking plants in the area? What is the status of the labor supply? As one of the factors relates to steel consumption in geographic areas, THE IRON AGE felt it would be of value to many metal product plants if a survey were made to determine how much steel is used by metalworking plants in each state.

The survey was conducted by means of a mail questionnaire to subscribers. The question asked concerned the amount of rolled steel received during 1946 at the plant where the questionnaire was sent, and it was phrased as follows:

***Tons of Steel Received at This Plant in* 1946?**

Total..... Flat Rolled..... Other.....

Flat rolled was described as including sheets, strip, light plate, tinplate and blackplate. Only a simple segregation of forms of steel into *"flat rolled"* and *"other"* was attempted in this initial survey. Replies were received from 2000 plants which received 6,000,000 tons of steel in 1946 and which employed 750,000 wage earners. Thus a 22 pct sample was obtained.

Realizing that it would be necessary to project the returns to arrive at total figures, it was decided to project the survey tonnages against the wage earner employment figures furnished by the U. S. Bureau of Labor Statistics as of July 1946. Accordingly, the questionnaire also asked for the number of wage earners in the reporting plant in July 1946. It was also recognized that some types of plants in the metalworking industry consume steel at a higher rate per 100 factory workers than do other types of plants. For this reason an overall wage earner projection would be inaccurate.

Thus the metalworking industry was divided into eight industry groups, in each of which the relationship between steel consumption and wage earners would be more nearly comparable as to the individual plants within. The eight industry groups are those used by the Census Bureau and the Labor Bureau.

The questionnaire also asked for the name of the major product produced in each plant, and from this information each reply was coded into the proper industry group. In compiling the results of the survey a total for the reported steel tonnage and wage earners was run off on a national basis for each of the eight groups. By means of the proportion of total wage earners to wage earners reported in the survey, the reported steel tonnage was projected separately in each of the eight groups to arrive at a total national tonnage figure for each group.

The next step was to distribute the total projected national tonnage in each industry group among the same industry groups in each of the 48 states. At this point it was determined that the sample brought in by the survey was a representative one when considered nationally, but might not be representative within every state. Taking cognizance of this situation a factor was developed which expressed the amount of steel received per wage earner for each industry group on a national basis. This factor was naturally different for each industry since some of the groups consume more steel per wage earner than do other groups. This national steel-per-employee factor was then applied to the total number of wage earners in the specific industry group within each state. In this manner a quantitative expression of steel tonnage was given to the industry group in each state in proportion to the wage earners engaged therein.

Repeating this operation of distributing the tonnage eight times for the eight industry groups in each state, and then repeating the cycle for all the 48 states yielded the tonnage figures, which, when added up, represent the amount of steel received by metalworking plants in 1946. Tabulation by states produced the end results of the survey which are shown in table I and fig. 1. The national total of rolled steel received at plants amounted to 28,000,000 tons. These figures were then checked with various authoritative sources of information. The final projected totals appear reasonably accurate.

The first four largest consuming states of Ohio, Michigan, Illinois and Pennsylvania were very close to

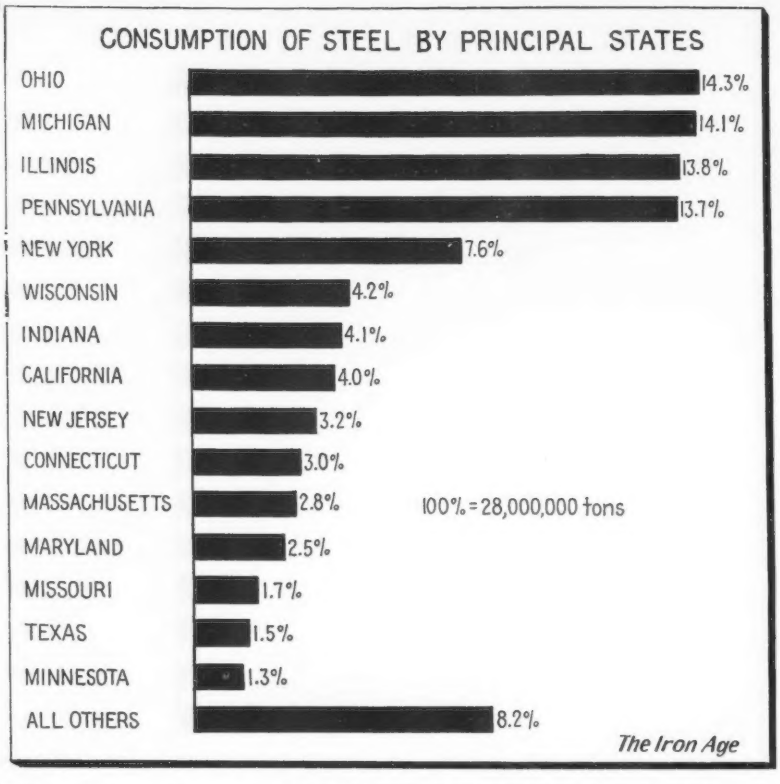


FIG. 1—Fifteen states account for 91.8 pct of total rolled steel received by metalworking plants in 1946. Graph is based on data in table I.

Table I

Rolled Steel Received by the Metalworking Industry In 1946 by States
(Thousands Net Tons)

Based on a survey by THE IRON AGE of metalworking plants only. Producers of metals, foundries, railroads, mines, oil companies and other companies whose major products are nonmetal are not included. Railway equipment manufacturers and forge shops are included in this survey.

State	Flat-rolled Steel	Other Rolled Steel	Total Steel Received[1]	Pct. of Total Receipts
Alabama	....	....	196	0.7
California	280	840	1,120	4.0
Colorado	....	....	56	0.2
Connecticut	479	361	840	3.0
Florida	....	....	84	0.3
Georgia	49	63	112	0.4
Illinois	2,009	1,855	3,864	13.8
Indiana	769	379	1,148	4.1
Iowa	120	76	196	0.7
Kansas	41	15	56	0.2
Kentucky	....	....	112	0.4
Louisiana	....	....	112	0.4
Maine	....	....	56	0.2
Maryland	490	210	700	2.5
Massachusetts	377	407	784	2.8
Michigan	2,409	1,539	3,948	14.1
Minnesota	....	....	364	1.3
Missouri	281	195	476	1.7
New Jersey	413	483	896	3.2
New York	1,234	894	2,128	7.6
North Carolina	....	....	56	0.2
Ohio	2,202	1,802	4,004	14.3
Oklahoma	16	40	56	0.2
Oregon	54	30	84	0.3
Pennsylvania	1,688	2,148	3,836	13.7
Rhode Island	17	95	112	0.4
Tennessee	129	67	196	0.7
Texas	290	130	420	1.5
Vermont	....	....	56	0.2
Virginia	84	56	140	0.5
Washington	....	....	168	0.6
West Virginia	....	....	196	0.7
Wisconsin	....	....	1,176	4.2
Other States	....	....	252	0.9
Totals	....	....	28,000	100.0

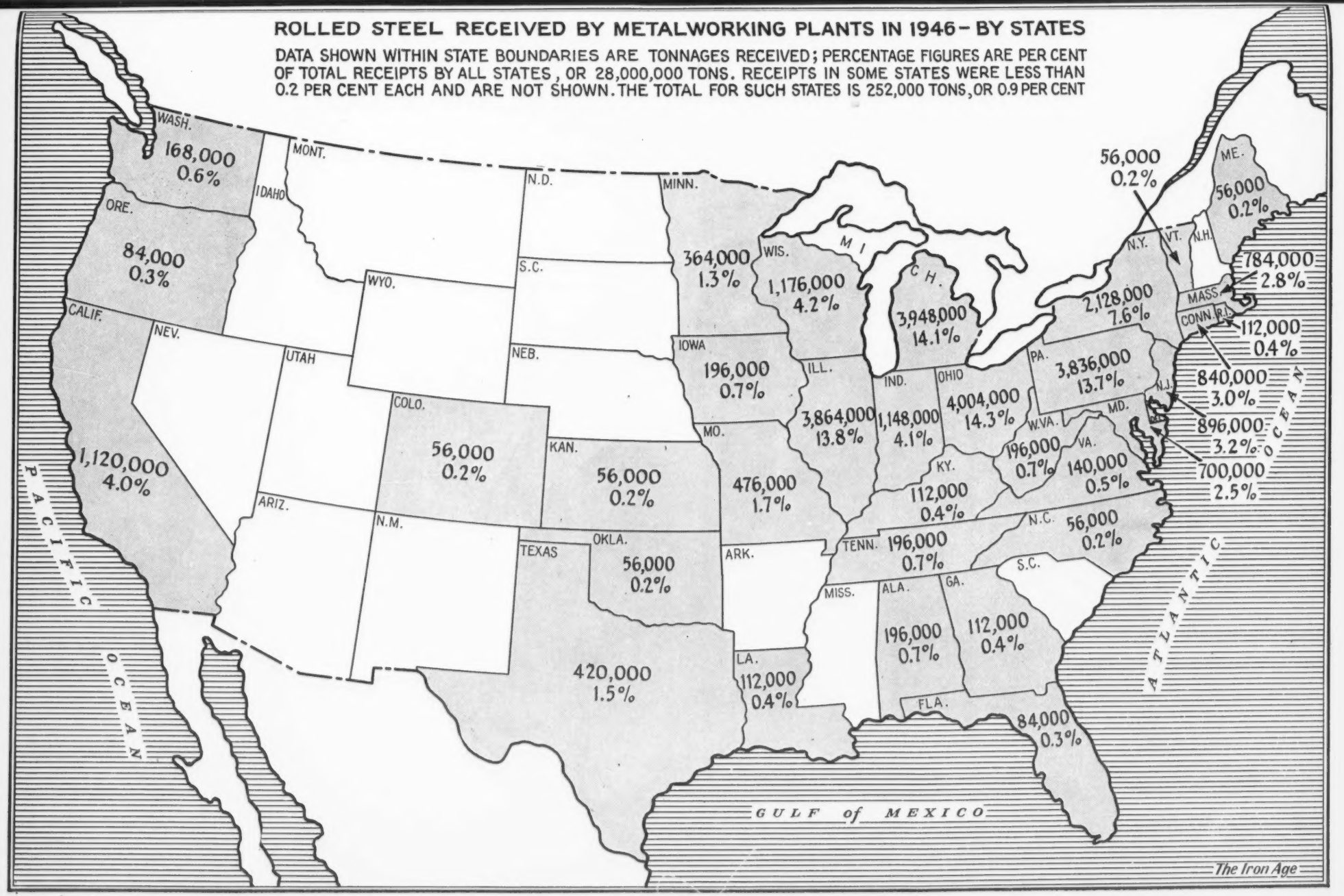
[1] In some instances, such as Alabama, total receipts reported by the companies were not sufficiently segregated as to product to permit a breakdown. In such instances only total receipts are given.

each other in total steel consumption, and any slight change in economic factors within an industry or within these states could easily alter the sequence of these four states. Taken at a different time a similar survey might show any of these four states in first position.

It should be noted that the survey embraced the steel receipts of manufacturers in the metalworking industry only, and does not account for all of the finished steel produced by the mills. The survey did not cover railroads, although the manufacture of cars and railroad equipment was covered. It likewise did not cover mines, oil companies or oil country steel products, utilities, exports, manufacturers in industries whose major products are not made of metal, a portion of jobber total, and a portion of construction. In connection with jobbers, the survey did cover the purchases of steel made by metalworking plants from jobber sources, but an unknown amount of jobber steel is sold to others besides metalworking establishments. Similarly in regard to construction the survey did cover construction steel which was processed in fabricating plants, but it did not cover construction steel sold directly to contractors without going through a fabricating plant.

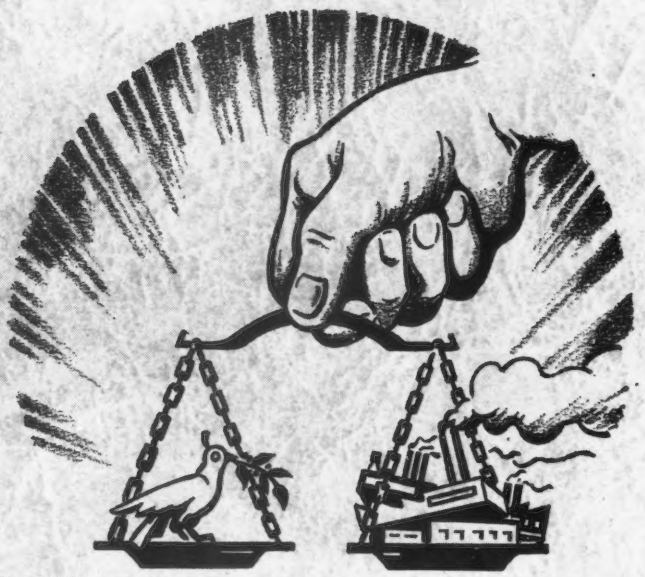
Producers of metals, and foundries, were omitted from the survey as steel is not production material in these plants within the definition and purpose of the survey. Steel scrap, of course, was not reported and neither were castings as the survey was limited to finished steel in rolled or drawn form in both carbon and alloy grades. A possible exception is forging billets as forge shops were included in the survey because forging establishments are a part of the steel-buying picture of the metalworking industry.

If a steel producer compares these figures with his own sales, the pattern of his sales figures will most likely differ from the survey. This would be due to inclusion of sales figures on rails, oil country goods and some of the other steel outlets not covered by this survey, and to the effect of competition in some of the states. THE IRON AGE desires to express its appreciation to all those supplying data for the survey and to those whose suggestions with respect to the statistical aspect of the survey added greatly to its accuracy and value.


ROLLED STEEL RECEIVED BY METALWORKING PLANTS IN 1946 – BY STATES
DATA SHOWN WITHIN STATE BOUNDARIES ARE TONNAGES RECEIVED; PERCENTAGE FIGURES ARE PER CENT OF TOTAL RECEIPTS BY ALL STATES, OR 28,000,000 TONS. RECEIPTS IN SOME STATES WERE LESS THAN 0.2 PER CENT EACH AND ARE NOT SHOWN. THE TOTAL FOR SUCH STATES IS 252,000 TONS, OR 0.9 PER CENT
WASH. 168,000 0.6%
ORE. 84,000 0.3%
CALIF. 1,120,000 4.0%
NEV.
IDAHO
MONT.
WYO.
UTAH
ARIZ.
COLO. 56,000 0.2%
N.M.
N.D.
S.C.
NEB.
KAN. 56,000 0.2%
OKLA. 56,000 0.2%
TEXAS 420,000 1.5%
MINN. 364,000 1.3%
IOWA 196,000 0.7%
MO. 476,000 1.7%
ARK.
LA. 112,000 0.4%
WIS. 1,176,000 4.2%
ILL. 3,864,000 13.8%
MICH. 3,948,000 14.1%
IND. 1,148,000 4.1%
OHIO 4,004,000 14.3%
KY. 112,000 0.4%
TENN. 196,000 0.7%
MISS.
ALA. 196,000 0.7%
GA. 112,000 0.4%
FLA. 84,000 0.3%
N.Y. 2,128,000 7.6%
PA. 3,836,000 13.7%
W.VA. 196,000 0.7%
VA. 140,000 0.5%
N.C. 56,000 0.2%
S.C.
MD. 700,000 2.5%
N.J. 896,000 3.2%
DEL. 840,000 3.0%
CONN. R.I. 112,000 0.4%
MASS. 784,000 2.8%
VT. 56,000 0.2%
N.H.
ME. 56,000 0.2%
PACIFIC OCEAN
ATLANTIC OCEAN
GULF of MEXICO
The Iron Age

WAY TO PROSPERITY

First on the agenda is world peace. After that, prosperity at home can come through the development of proper fiscal policies, rehabilitation of the profit system, organization of world trade principles on a higher plane of responsibility, increasing peoples' purchasing power, and removal of force as a weapon for settling labor-management disputes.



By BEARDSLEY RUML

Chairman of the Board, R. H. Macy & Co., Inc.,
and
Chairman of the Federal Reserve Bank
of New York

TODAY the United States has two great goals—peace in the world and prosperity at home. Peace comes first; it also comes second, third, fourth and fifth. Of all the practical concerns of business men today, the organization of a just and durable peace is the most practical, because it is the most necessary. All other practical matters are far down on the agenda, except as they contribute to a peaceful world. This does not mean that other practical matters are not on the agenda at all, only that they have been pushed down the list in terms of urgency and importance. The thing that pushed them down was The Bomb.

The Age of Atomic Energy is only a few months old; with careful handling, it should last a long, long time. But there is no guarantee. In case of accident, your money will *not* be refunded.

Today the world stands in a moment of tense and uneasy quiet. The reality of controlled atomic energy has come as a blinding flash of knowledge. All eyes have seen an epoch-making and abrupt change in man's relationship to the universe. Next will come the sweeping changes in man's relationship to other men.

What is to be done about peace? The overall objective is to secure world peace decisively and permanently. No lesser objective is worth bothering with because the time at hand is far too short.

Three Programs For Peace

All the recent confusion and needless controversy comes from failure to distinguish among several programs, each one of which is good. It is necessary to embark simultaneously on three programs, A, B and C. A, a long-term program; B, an intermediate program; and C, a short-term program. They must begin at the same time, *now*, even though their terminal points are long, intermediate and short in time. The three programs must be mutually consistent. They must support one another.

The long-term program would be directed toward the establishment of world government; the intermediate program toward the support of UN; the short-term program toward the use of diplomacy, public and private, for the reduction of international tension.

With success in the intermediate and short-term period, there is a margin of 20 yr in which to work. The long-term program, the 20-yr program, is the establishment of world government under principles of law, justice and human freedom. Such a world government cannot be imposed by force. It cannot be successfully negotiated today by the statesmen of the nations of the earth. The plain fact is that world government requires as its foundation a moral and psychological sense of world community. That foundation does not exist today. To impose or to negotiate a world government under existing conditions of prejudice and hate would do nothing more than set the stage for world civil war. The minds and hearts of men are not yet prepared for a world of law, justice and mercy.

With 20 yr to spare, the moral and psychological foundation for world peace can be laid. The hope lies in the fact that it takes only a period of about a dozen years to implant a basic culture in the mind of a man—the period of childhood between the age of 2 and 14. In a psycho-biological sense, history, tradition and custom are only about 12 yr old. And, of course, it is known that with more or less difficulty, changes can be made in the human mind even after the 12 formative years have passed.

Support of UN Essential

So much for the long-term program. Program B, the intermediate program, should be pointed at a period of some 3 to 8 yr off, perhaps a little longer. For the intermediate program the objective is clear and the method is at hand. The objective is to create through the United Nations the symbolism of world association and the practice of world cooperation. The UN is made to order for such practice in world relationships. Anything that today can be done at all can be done through the UN. At the same time, the UN does not compel things to be done for which we are as yet unprepared. The danger is that the easy protocol of the UN will lull the world to sleep. The absence of critical compulsions in the Charter must arouse in everyone a sense of moral responsibility to go beyond the form and into the substance of world cooperation.

Now, consider Program C, the short-term program—it is to strive through the channels of diplomacy and other day-to-day international contacts to remove or at least to lessen the tensions that exist in so many parts of the world. Some of these tensions are perhaps less serious than the headlines would indicate; but they are bad enough.

One of the present sources of international tension is atomic energy itself. All the nations must move promptly to a first solution that will satisfy the conscience of the world. Certainly the first solution will not be the final solution, and that policy here as elsewhere will reflect progressively expectations of success in the organization of permanent peace.

However, all plans must not be based on success of the short-term program. If, after 18 months or 2 yr, the tensions in international relations increase, the time will have come for active measures of defensive relocation and reorganization. The timetable is set by the existence of The Bomb. If after 2 yr, diplomacy, public and private, and the ordinary contacts of people across frontiers, have failed to prevent a deterioration of world relations, then those nations that can unite should do so, leaving the way open for broader federation later on. But in the United States

" . . . Profit is more than a mere energizer of private enterprise, it is a directive energizer. It sets the test of success in the application of effort. It is both stimulus and response. It is not what business is for, it is not the justification of business activity; but it is so important in getting business properly done that it is sometimes mistakenly taken to be the end and purpose of business."

eyes must be open to the fact that the failure of public and private diplomacy in the short-run program would create the unwelcome and dangerous possibility that the world might be divided rather than united, and that soon rather than late.

The first goal, the organization of a durable world peace, requires that world economic relationships be established on a humane and orderly basis. For the success of all these international plans a high level of employment and production in the United States is everywhere conceded to be indispensable. With high prosperity, large imports of raw materials will be required and ways will be found to obtain the economic advantages of lower tariffs on foods and manufactured goods. With high prosperity, the U. S. will be less greedy for foreign outlets to take up excess capacity and there will be more willingness to see exports directed to the world's essential needs. With high prosperity, it will be easier to reduce restrictive practices and discriminatory prejudices that spring from fear and result in contempt and hate.

The first requirements for prosperity are those basic things on which all production depends, namely, raw materials, cheap and widely available power, a reliable system of transportation, a sound currency, and an abundance and variety in human skills. The U. S. is well provided with these basic requirements for prosperity.

It is appropriate that some attention be given to the responsibility of world trade and of American traders in promoting the cause of peace. These responsibilities will of necessity be discharged in specific day-to-day transactions. However, would it not be helpful if those who have the promotion of world trade at heart could come to some general agreement as to the principles under which world trade should be carried on, bearing in mind the present state of scientific advance and political anarchy? As a suggestion, and subject to addition, deletion, and modification by those who know more about world trade, here are eight points of principle that might be considered:

(1) To put peace before profit when they are in conflict.
(2) To open up the channels of trade for raw materials, products and services.
(3) To cooperate in raising the standard of living everywhere.
(4) To avoid the corruption of governments and to be cautious in accepting special privilege from governments.
(5) To refuse to participate in the exploitation of peoples.

" . . . For some reason it has become indelicate to refer to profits in public, except perhaps to deplore the fact that they seem to be necessary for the propagation of business enterprise, or to imply that the activity of profit-making is slightly piratical, to say the least."

(6) To be patient in promoting changes in established ways of life.
(7) To administer transactions justly and equitably.
(8) To create in personal relationships confidence, tolerance and goodwill.

The second requirement for prosperity is the organization of basic elements into a working pattern of production and distribution. Today it is clearly seen that, even though all else can be organized, it is to no avail unless there is a harmonious and acceptable foundation in satisfactory labor relations.

The labor conflicts that have harrassed the country are not as simple as they are sometimes described, as controveries between two adversaries, capital and labor. Today there are four parties directly at interest in the conflict—owners, managers, labor leaders and workers, with millions of unorganized workers and small businessmen on the sidelines, but by no means outside the danger zone of minor injury or disaster. The basic objective in the field of labor relations is not unlike the basic objective in the field of international relations, that is, to eliminate the use of force in the settlement of disputes and to establish in its place a system of law and justice based on consent. Of course, controversy and disputes cannot be eliminated, but the number of them can be reduced, and it can be seen to it that settlements are arrived at in terms of recognized principles, justly applied and adequately enforced.

The third requirement for prosperity is the maintenance of an adequate, effective demand for the goods and services which the country is able to produce. Even though there are present the basic elements for production and they are organized so that abundant output can be realized, nevertheless without an effective demand that will move these products into consumption, the channels of distribution will become clogged, the means of production will be made idle, mass unemployment will appear, and prosperity will fade away.

Today the country is experiencing an unprecedented demand for the products of business and agriculture. This demand is the result of many years of shortages and of enormous purchasing power in the hands of the people. The demand in fact is so great that many restraints are necessary to keep it from expressing itself in an inflationary price rise. In a period such as the present, when effective demand is so great that arbitrary regulations and controls are still needed to prevent inflation, it is easy to forget that all through the 30s, and perhaps in the 20s, too, effective demand was not sufficient to move the products which business and agriculture could produce. *Nor have those corrections of past policies and practices been made which would give us confidence that such periods will not come again.* It is for this reason that there is need to consider national fiscal policy as a principal means of helping to maintain a condition of high prosperity.

It can be safely predicted that during the next few years there is going to be a considerable amount of discussion on the subject of balancing the federal budget. There certainly was a good deal of discussion on this subject in the years preceding World War II, and the matter was hardly settled to everyone's complete satisfaction. Accordingly, the country shall probably begin debating the matter about where it left off, with two important differences, namely, that the national debt is about six times what it was then and the interest rate is somewhat lower.

From one point of view it is surprising that the bal-

VITAL to future peace is the success of the United Nations, shown here during a recent meeting of the Assembly. The UN should be made the symbolism of world association and the practice of world cooperation. Anything that can be done today to further the cause of peace can be done through the UN, the author of this article believes.

ancing of the federal budget should be a debatable issue at all. This is one of the few objectives of national policy on which there is widespread popular agreement. People in all walks of life, without regard to political party, want the budget balanced.

The discoveries and insights coming out of World War II are by no means limited to physics, chemistry, biology and surgery. Advances have also been made in the fields of finance and economics. The full import of these advances is not yet understood, but enough is known that some things that many competent people thought were true are either false or true in a different way than was believed.

One example of a new insight in the field of fiscal economics touches upon the belief held by most people in the 1930s that a deficit in the federal budget was inflationary. Today it is seen that a nation that has millions of unemployed who want to work and billions of dollars invested in idle plants and equipment is much like a factory or company that has a sizable amount of unused capacity. Under such circumstances, an increase of demand tends to reduce unit costs, and therefore under competition tends to reduce prices rather than to increase them. For the same reasons, federal deficits prudently incurred in times of mass unemployment, since they also tend to reduce unit costs, tend to be deflationary rather than inflationary as far as the purchasing power of the dollar is concerned.

These discoveries, insights, or whatever they are called, in the field of economics and finance are just as real as radar, DDT, and atomic energy. They are not matters of theory or wishful thinking, they are matters of experience and observation. The plain fact is that the war was actually financed on a declining rate of interest. This means that a new relationship has been created between the private money market and the national state. This relationship was created in 1913, 1933 and 1934, but it required the impact of a World War to give the factual basis for understanding, in part at least, what had happened.

Now turn specifically to the problem of taxation to see what changes may be needed in basic tax policies as a result of new insights in the area of fiscal economics. The financial history of the past 10 yr makes it apparent that nations have been able to pay their bills even though tax revenues fell short of expenses. Those countries whose expenses were greater than receipts from taxes paid their bills by borrowing the necessary money. The borrowing of money, therefore, is an alternative which governments use to supplement the revenues from taxation in order to obtain the necessary means for the payment of their bills.

To be sure, the borrowings of a country must be paid in money at some future date when the loans fall due, and, in the meantime, interest must be paid on the principal of the loan. Since, when a government borrows, it must provide the money for both principal and interest, its need for taxes seems greater than ever—the only difference being that the time of taxation is postponed.

However, when these loans fall due, the government may decide to borrow again and, with the proceeds of the new loan, pay off the principal of the old. Such a refunding operation again provides the money which the government needs—and, again, the need for present taxes is avoided.

A government which depends on loans and on the refunding of its loans to get the money it requires for its operations is, necessarily, dependent on the sources from which the money can be obtained. In the past, if a government persisted in borrowing heavily to cover its expenditures, interest rates would get higher and higher—and greater and greater inducements would have to be offered by the government to the lend-

" . . . Profit is the excess of selling price over costs of every kind. If a thing cannot be sold, there can be no profit. Nor will there be a profit unless the selling price is greater than the total cost of getting the article into the purchaser's hands."

ers. As a consequence, power over the government would gradually shift, in some measure, to the money market, which could dictate the terms on which the necessary loans would be made. Governments then found that the only way they could maintain their sovereign independence and their solvency was to tax heavily enough to meet a substantial part of their financial needs, and to be prepared—if placed under undue pressure—to tax to meet them all.

The necessity for a government to tax in order to maintain both its independence and its solvency still holds true for state and local governments, but it is no longer true for the national government. Two changes of the greatest consequence have occurred in the last 25 yr which have completely altered the position of the national state with respect to the financing of its requirements. The first of these changes is the gaining of vast new experience in the management of central banks. The second change is the elimination, for domestic purposes, of the convertibility of the currency into gold or any other commodity. No longer do private lenders have the final word on the fiscal policies of a national government which does not tax.

The United States is a national state which has a central banking system, the Federal Reserve System, and whose currency, for domestic purposes, is not convertible into gold. It follows that the federal government has final freedom from the money market in meeting its financial requirements. Accordingly, the prime consideration in the imposition of taxes has become the inevitable social and economic consequences of the taxes that are imposed. Since all taxes have consequences of a social and economic character, all federal taxes must meet the test of public policy and practical effect. The social and economic consequences of a federal tax should never be obscured under the mask of raising revenue.

By all odds, the most important single purpose to be served by the imposition of federal taxes is the maintenance of a dollar which has stable purchasing power over the years. Sometimes this purpose is stated as "the avoidance of inflation"; and without the use of federal taxation all other means of stabilization, such as monetary policy and price controls and subsidies, are unavailing. It is of course also true that federal taxation alone cannot prevent inflationary price rises in periods such as the present. All other means, in any case, must be integrated with federal tax policy if we are to have tomorrow a dollar which has a value near to what it has today.

The idea behind tax policy should be this: That taxes should be high enough to do their part protecting the stability of our currency, and no higher. Putting it another way, taxes should be as low as possible without putting the value of our money in danger of inflation. The lower taxes are, the more purchasing power will be left at home in the hands of the people—money that can be spent by them for the things they want to buy or that can be saved and invested in whatever manner they choose.

The basic principle of tax policy is: Tax rates should be set to balance the budget at high levels of employment. Having been set, these rates should be left alone, except as there may be important changes in public policy or significant shifts in the level of potential productivity.

If tax rates are set to balance the budget at high levels of employment, the two critical factors are (1) the size of the budget and (2) the national income at high levels of employment.

Obviously under such a policy the lower the budget the lower our tax rates could be. This does not justify spending for its own sake nor any wasteful expenditure.

How shall this level of potential national income be estimated? The best procedure would seem to be to take a level the country would be willing to live with over a period of years. Two or three years ago a level of $140 billion was widely suggested, but today, on the assumption that efficiency will be restored, the $140 billion figure seems somewhat too small. In any case, the higher the level that can be supported by reasonable estimates the more conservative it is, since the result will be lower tax rates and less danger of mass unemployment.

The budget should be taken excluding social security which raises fiscal policy questions of its own. Given the prospect of a world at peace, the writer believes that the federal budget at high levels of employment can be held below $20 billion and still provide the administrative and social services that the modern national state can appropriately provide.

" . . . Of all the practical concerns of business men today, the organization of a just and durable peace is the most practical, because it is the most necessary."

Protection of Individual Enterprise

The protection of individual enterprise is not an end in itself, and interest in its protection stems from a profound conviction that private enterprise is a bulwark of human freedom. Individual enterprise is inextricably bound up with profits. For some reason, it has become indelicate to refer to profits in public, except perhaps to deplore the fact that they seem to be necessary for the propagation of business enterprise, or to imply that the activity of profit-making is slightly piratical, to say the least.

Profit is more than a mere energizer of private enterprise, it is a directive energizer. It sets the test of success in the application of effort. It is both stimulus and response. It is not what business is for, it is not the justification of business activity; but it is so important in getting business properly done that it is sometimes mistakenly taken to be the end and purpose of business.

The familiar relationship between selling price and costs, which results in profit, causes profit to serve two exceedingly important purposes. In the first place, profits are a test of whether the thing that is made is wanted, and whether enough people want it at the price at which it is offered more than they want something else at some other price.

The necessity of making things which must sell directs the energies of private enterprise into the channels of making things which people want more than they want something else. It stops business from trying to do things that get no public response and that

meet no public need. And since most things compete with other things as objects of human desire, and since they compete both in desirability and in price, the managers of business are forced to seek a right price for the things they have to sell.

In the second place, profits serve as a check on costs, and hence as a means of reducing wastes of all kinds, The costs must be brought below the price at which the thing will sell in adequate quantities, and the lower the cost the greater the profit and the greater the possibility of wider use.

The beneficial pressure of profit on cost reduction comes from giving an impulse to efficiency and ingenuity; it provides an incentive for the discovery of new processes and new machines for the elimination of waste motion and unneeded services. This kind of cost reduction results in the use of less human effort and less material in the producing and selling of a given article. Economy in the use of resources of men and materials, while at the same time maintaining the same or a higher standard of living, serves a valuable social purpose, and the pressure for profits is the principal influence to this end.

How high can profits properly be? If the goods are sold squarely and priced competitively, if the costs of producing them are governed by intelligence and by the use of fair and legal methods, if there is no direct or indirect public subsidy that makes prices higher or costs lower than the managers of the business themselves could make them, then the higher the profits the better the interests of all are served.

When profits are made (1) within the law, (2) under competitive enterprise, (3) without public subsidy, or (4) without public protection of exclusivity, the higher the profits the greater the honor to the profit-maker. Under these circumstances, there should be no limitation on the amount of profits which a business can make, because the greater the profits the greater the service.

Profit, as a directive energizer of business, deserves more respect than it is sometimes accorded. It would be difficult indeed to find a substitute that would serve the public welfare so well.

The undernourishment of business comes from insufficient profits and prospects of profits. When this condition applies only to a particular business, the disorder can be regretfully charged to the requirements of survival in a competitive universe. But when business generally is undernourished for lack of profits, it is wise to look to the environment generally. In such a situation the presumption is that the environment is not favorable to business survival.

Although profits serve in many ways to make the business system function wholesomely, in recent years there has been a change in the structure of business which has seriously affected the usefulness of profit as a directive energizer.

Private enterprise today is increasingly passing into the hands of the higher paid employees, workers for wages who have the administrative responsibility for their enterprises. Unless they are substantial shareholders, their interest in profit is, beyond a certain point, largely academic. To be sure, they want their company to survive, and they want to be well regarded by their colleagues and by their competitors. But effortful enterprise beyond this minimum required for security and prestige is meaningless. This is bad for enterprise, and a danger to the enterprise system. Consider how this situation comes about and what, if anything, can be done to correct it.

" . . . The federal budget (excluding social security) at high levels of employment can be held below $20 billion and still provide the administrative and social services that the modern national state can appropriately provide."

Profit is what remains after the expenses of a business are deducted from its sales. These expenses include the cost of materials, wages and bonuses, taxes, rents, and interest on bonds. From this profit, dividends may be distributed as a return to the stockholders on their invested capital, and a part of the profit may or may not be shared with a large or small proportion of the employees. In most cases the amount of the shared profit is small as compared with wage and salary disbursements.

There then remains a residual profit that attaches to the common stock for the benefit of the common stockholders. Since, today, an increasingly large proportion of the stockholders of enterprise make no contribution to its success, other than permitting their money to remain invested in it, this residual profit is increasingly less helpful in strengthening private enterprise. It is, of course, true that the owners of the common stock of a company have money at risk and, therefore, are entitled to a contingent return, depending on the success of the company. They also are entitled to have adequate reserves set up for depreciation, depletion, obsolescence and other conditions that may reduce the value of assets of all kinds. The contingent return on the common stock can be limited and the appropriate reserves can be defined, and both should be given a position prior to residual profit as it has been conceived.

The residual profit should go exclusively to the one or two individuals whose initiative and judgment is decisive for the success of a business; and, under ordinary conditions, this residual profit should be large in comparison with their regular compensation. In this way, profit could be restored to one of its most impor- that functions in providing an aggressive, efficient, and serviceable system of private individual enterprise.

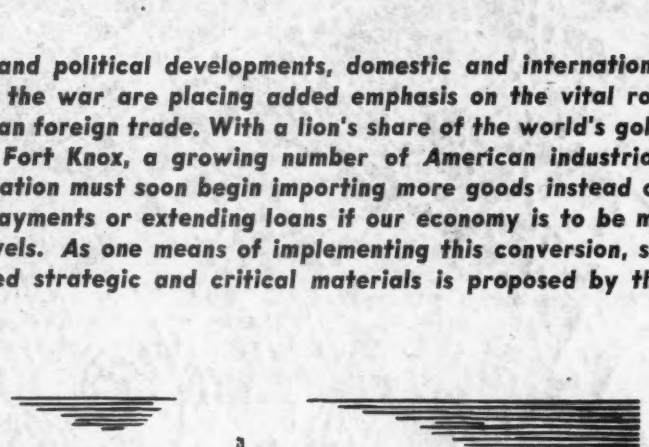
The dangers to individual enterprise arise in large measure from neglect and abuse of the profit system. The protection of individual enterprise will be substantially accomplished if the profit system is rehabilitated.

This means that purchasing power in the hands of the people be in proportion to their capacity to produce; that labor and management cooperate in getting wages up and costs down; that taxes be assessed on incomes and not on profits; that the residual profits of enterprise go to the enterprisers; that selling prices be established by competition; that misbranding and adulteration be outlawed; and, finally, that everyone recognize that public regulation in the public interest is necessary if public subsidy or grant of monopoly has been received.

" . . . The basic objective in the field of labor relations is not unlike the basic objective in the field of international relations—that is, to eliminate the use of force in the settlement of disputes and to establish in its place a system of law and justice based on consent."

FOREIGN TRADE

Economic and political developments, domestic and international, growing out of the war are placing added emphasis on the vital role played by American foreign trade. With a lion's share of the world's gold already buried at Fort Knox, a growing number of American industrialists hold that this nation must soon begin importing more goods instead of accepting gold payments or extending loans if our economy is to be maintained at high levels. As one means of implementing this conversion, stockpiling of imported strategic and critical materials is proposed by the author.



By G. F. SULLIVAN

Associate Editor

THE IRON AGE

FUNDAMENTALLY, the only justification for all trade is to place at the disposal of the consuming public the optimum level of needed and desired economic goods. This fundamental truism applies to our domestic trade and to our international trade.

When New England exchanges its highly specialized products for the oranges of Florida or California, an economic benefit accrues to each region and to the nation as a whole, through the application of a principle of specialization in the production of goods and services. Important as is this principle in the economy of any individual country, of even greater importance is it in exchanges between nations.

We may easily visualize what would happen to the United States if each state, in a wave of collective madness, suddenly decided to become self-sufficient by erecting barriers to the free interstate exchange of commodities. This nation's forefathers had this danger so firmly in mind that in framing the Constitution, special provision was made to prevent such shortsighted egoism interrupting the flow of commodities between the state of the Union.

Foreign Trade Vital to Nation

Different as our states are, they nevertheless are more alike than the far flung areas of the earth in which physical and human resources, not to mention climatic conditions, are so diversified that the contribution of all of them to the activities of man, wherever they happen to be exerted, is indispensable to the healthy life of a world suddenly become one.

Foreign trade, as a consequence, is vital to the attainment and maintenance of high standards of living in all countries, particularly for our nation, leading the world in the production and distribution of the necessities and amenities of life for the well-being and enjoyment of its people. No nation, however, is self-sufficient and least of all, the United States. The threads that compose the fabric of the modern industrial and distribution process are so manifold and so varied that the more a country becomes industrialized, the more it relies for raw materials, semifinished and finished manufactures on foreign sources.

The United States has reached a higher level than any yet known to man in the development and integration of industrial enterprises. But the channels of its bloodstream lead to many hearts located the world around. In the past about 60 pct by value of our total imports consisted of crude materials and foodstuffs. If the next generation succeeds in increasing present levels of production at the same rate as during the last 25 yr, the problem of assuring imports of raw materials required for maintaining American employment and American living standards will indeed become serious. These imported raw materials now include such vitally important items of food and drugs as sugar, coffee, tea, quinine, spices; of fibers, such as silk, flax, wool, wood pulp, leather, hides and skins; of fats, such as vegetable oils; of resins, such as rubber; of minerals, such as tin, manganese, tungsten, chrome, nickel, bauxite, diamonds, lead, zinc, mercury, cobalt and others.

This is only a partial list. But even casual perusal convinces one that imported materials condition not only the comforts of our manner of life, but even the very existence of such basic industries as steel, oil and automobiles.

The realization of this dependence upon foreign sources of supply for the necessities and amenities of daily life, cannot fail to awaken a real appreciation of the fundamental importance to our nation of that provision of the Atlantic Charter which promises:

"Equality of access to the world's raw materials and markets to victor and vanquished alike."

The dislocation of the necessities of our economic life, not to mention the comforts of existence, such as occurred during the recent war, has strikingly demonstrated the fallacy of any belief in this nation's self-sufficiency.

Reserve of Natural Resources

The United States has been blessed with a reserve of natural resources comparatively plentiful if measured in terms of some other nations; nevertheless, the pace at which these resources are being consumed by industry is so great that many are becoming alarmingly depleted. Suffice it to mention that the steel industry used during the war almost 100 million tons of iron ore a year. Such quantity, in many foreign nations, would be considered sufficient to justify the installation of a steel industry designed to supply the needs of its markets for several generations.

An organized survey of national resources and a study of their relationship to the present and anticipated future requirements of our domestic market, unfortunately does not exist. The incomplete facts known, nevertheless, lead to the conclusion that, aside from the raw materials for which this nation entirely relies on foreign sources, the existing situation as regards many essential commodities now amply secured from domestic sources, such as copper and iron ore, is in reality less bounteous than it is generally assumed to be.

Dependent as we are as a nation, upon the wealth contributed to us by foreign countries, these countries are even more dependent on American supplies, for the time being at least. Over the long period, however, America must realize, as do certainly foreign nations, that we are indeed vulnerable in our very strength and production power. In the long run, these same foreign nations have within their power, should they choose to use it, the means—through throttled imports—to dictate our industrial index, and hence

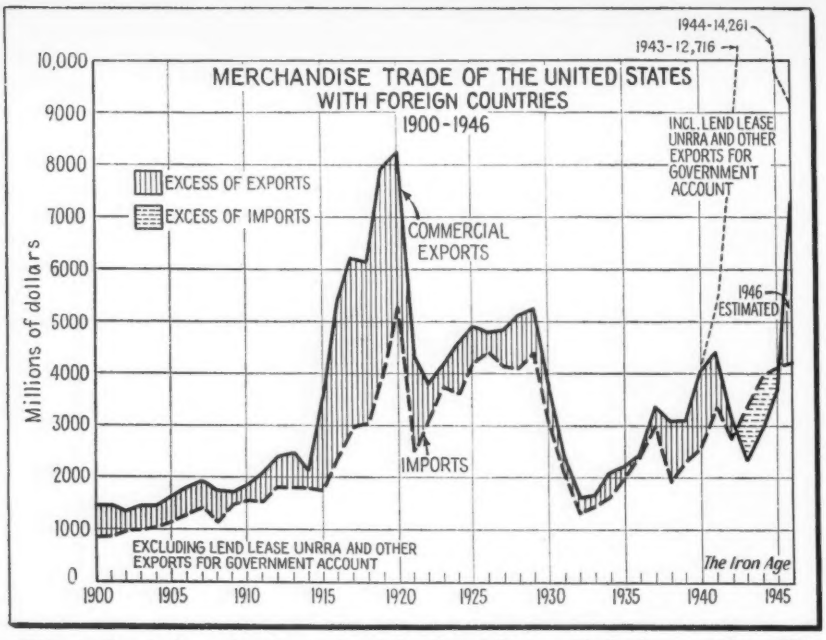


FIG. 1—Trend of merchandise trade of the United States with foreign countries, 1900 to 1946. Lend lease is reflected by the light dotted line at the upper right.

our employment, prosperity and even political and social peace.

More than 50 pct of the world's production capacity is founded in the United States; inevitably this nation must export the products of American agriculture and industry to keep the wheels of the world turning. For to the world's normal needs must be added the universal demand for American goods required for the rehabilitation of a world ravaged by the most destructive of wars. It is, consequently, reasonable to assume that United States exports will, in the coming years, reach a volume two or three times the prewar level.

Since the balance of our international merchandise trade has, in late years, consistently shown an excess of exports, and since we are progressively becoming more dependent on imported raw materials, foreign trade and the rules under which we choose to play the game—that is our foreign economic policy—become of prime concern. Fig. 1 illustrates the trend of merchandise trade of the United States with foreign countries from 1900 to 1946. Fig. 2 graphically emphasizes this excess of exports by commodity group and by geographic area.

Thus the provision of the Atlantic Charter, guaranteeing equality of access to the world's raw materials, in all markets without discrimination to any nation, becomes a matter of self-interest to each one. Consequently, too, as never before, foreign policy particularly as it relates to a foreign economic policy directed to guarantee full compliance with this provision of the Charter, becomes a living issue for the nation.

The two-way exchange of goods and services, such as insurance, ocean freight, brokerage, etc., makes up the so-called international trade of merchandise and service. When it balances, the payment for the goods and services we supply is easily provided by dollars resultant from our purchases abroad.

Expenditures of Americans traveling abroad, or of foreigners traveling in the United States; the remittances of residents of the United States to foreign beneficiaries or of foreign residents to American beneficiaries; the extension of credits to or from foreign nations and ultimately the movement of gold contribute to, and in the end reach, an accounting balance in our income and outgo.

Since the end of the last century, the export trade of the United States has shown a chronic excess of merchandise exports which, from a trickle during the years preceding the first World War, swelled into a mighty river during the 20s and finally reached flood volume through Lend-Lease. This torrent has subsided, but not sufficiently because of world demands for reconstruction and rehabilitation.

Realistically then, for some years to come, the evidence indicates that our balance of payments, as far as merchandise and service are concerned, will continue disturbingly in our favor. This means that if present foreign economic policy, or the lack of it, is continued, the foreign countries which receive our goods and services will be short of dollars with which to pay for our goods. This is graphically illustrated in Fig. 3.

America Accumulates Gold

Undoubtedly, private remittances of dollars to foreigners by residents of the United States already make a small contribution to the weak side of the balance, and the expenditures of American tourists abroad, now negligible, may in the near future very substantially help to reduce the deficit. Nevertheless, the bulk of the difference has been settled in the past, is being settled at present, and according to all signs is going to be settled in the future, by importation of gold and the extension of American credits.

A few elementary truths will shed some light on the real nature of the last two means of balancing this country's international payments. Except for limited ornamental purposes, dental, and a few other industrial applications, quite restricted in scope, gold is not a useful commodity in itself. Its value resided in the past, and despite recent trends noticeable in some foreign countries, still resides in the fact that it provided a stable yardstick upon which the different paper currencies of the main trading nations were based. In other words, the importance of gold was, and remains, due to the fact that it represents (or did represent) a standard for measuring the value of economic goods, rather than in the fact that it had or has any broad intrinsic value, per se.

Apropos the attributes of gold, consider the policy which the United States was obliged to adopt when large accumulations began to pile up. Since gold was not suitable for useful direct utility and consumption and did not really increase the common wealth of the nation, it became necessary to sterilize it to avoid dangerous inflationary results. Though buried at Fort Knox, the inflationary ghosts still haunt government and Wall St. alike.

American willingness to buy all gold offered us at $35.00 per oz has been a costly practice. Encouraged by such policy, the world production of gold nearly doubled between 1930 and 1940, and imports of the metal assumed such proportions that this nation now

finds itself saddled with a sterile hoard of more than $20,400,000,000, equal to about 55 pct of the estimated visible world stock. Since 1934, when by government decree the price of the metal was boosted from $20.67 to $35.00 per oz, we have actually surrendered $10 billion worth of American goods in exchange for the yellow metal.

Before the war, Russia was producing about 5 million oz of fine gold annually, worth $175 million at the current price. The Soviet Union has on order in this country at least four of the largest gold dredges ever built, an indication she intends to step up her already high production.

This might afford the key to Russia's seeming indifference to international agreements for smoothing the mechanism of foreign trade, and to her apparent lack of eagerness in exploring loan possibilities, because, as matters now stand, the Soviets can pay in gold for anything they want from the United States and there is ample room at Fort Knox. Russian manganese, lumber and furs would be much more acceptable in exchange for American machinery and equipment, services and know-how. It is evident then that to increase United States gold still further is no real solution to the problems of international finance and is of no benefit to the United States. The major remaining alternative for balancing international payments is the extension of American credits to foreign nations.

To dig our dwindling iron and other mines, to process the ores, to add all the craft of our workmanship and the ingenuity of our management and the yield of our savings, combined to produce a piece of highly finished merchandise (such as in normal times constitutes about 50 pct of U. S. exports), in order to ship out from our borders and distribute abroad such merchandise, without receiving in return a realistic prospect of repayment in useful goods and services, seems to be quite a wasteful use of our natural resources. Yet, undated promissory notes are too often the result of loans indiscriminately extended by public or private institutions to public or private foreign borrowers.

Admittedly, in some cases international loans should be granted when they can really contribute to the economic development of foreign lands or to the settlement of international accounts in times of emer-

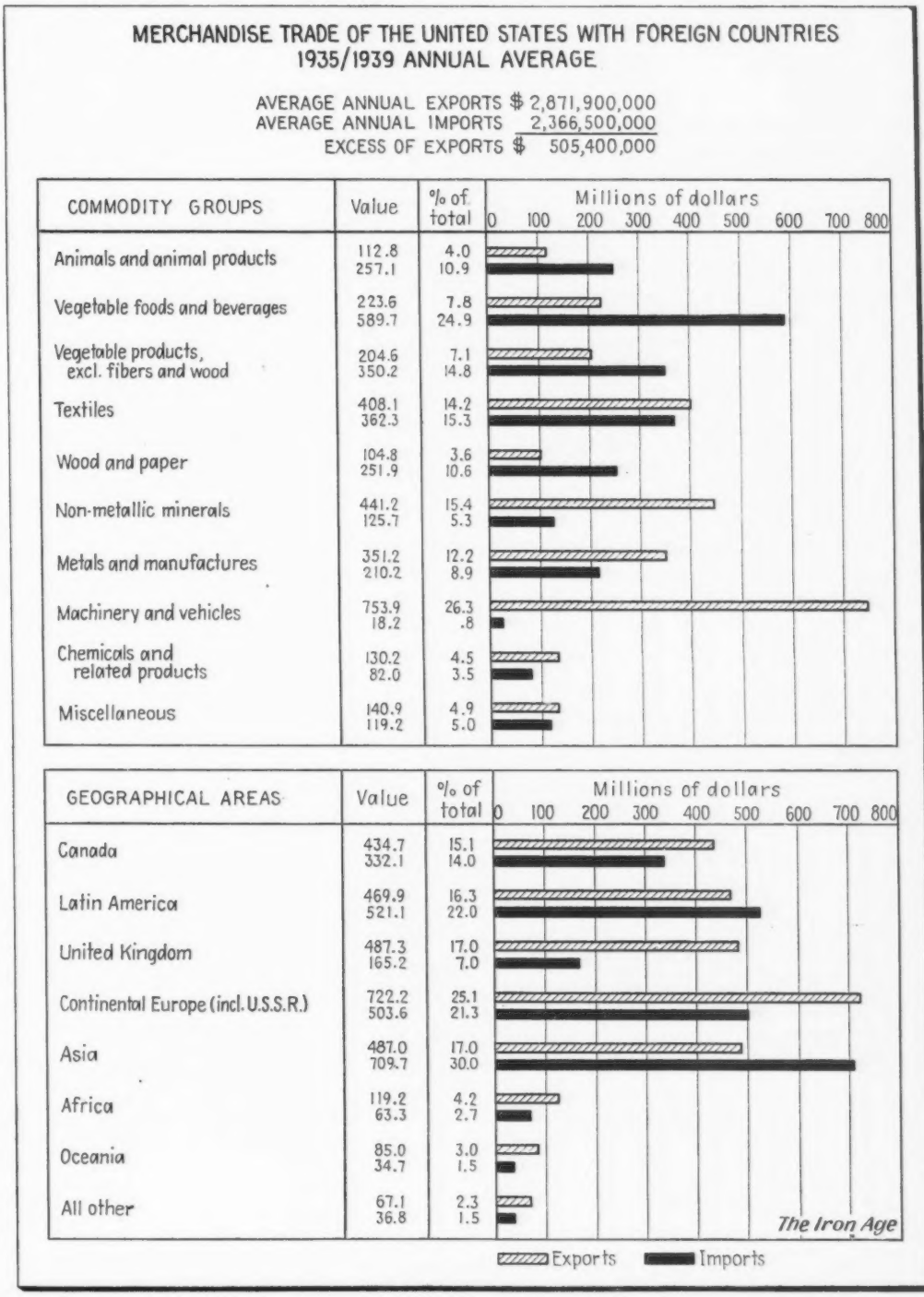

MERCHANDISE TRADE OF THE UNITED STATES WITH FOREIGN COUNTRIES
1935/1939 ANNUAL AVERAGE
AVERAGE ANNUAL EXPORTS $ 2,871,900,000
AVERAGE ANNUAL IMPORTS 2,366,500,000
EXCESS OF EXPORTS $ 505,400,000
COMMODITY GROUPS
Value
% of total
Millions of dollars
0 100 200 300 400 500 600 700 800
Animals and animal products 112.8 4.0 / 257.1 10.9
Vegetable foods and beverages 223.6 7.8 / 589.7 24.9
Vegetable products, excl. fibers and wood 204.6 7.1 / 350.2 14.8
Textiles 408.1 14.2 / 362.3 15.3
Wood and paper 104.8 3.6 / 251.9 10.6
Non-metallic minerals 441.2 15.4 / 125.7 5.3
Metals and manufactures 351.2 12.2 / 210.2 8.9
Machinery and vehicles 753.9 26.3 / 18.2 .8
Chemicals and related products 130.2 4.5 / 82.0 3.5
Miscellaneous 140.9 4.9 / 119.2 5.0
GEOGRAPHICAL AREAS
Value
% of total
Millions of dollars
0 100 200 300 400 500 600 700 800
Canada 434.7 15.1 / 332.1 14.0
Latin America 469.9 16.3 / 521.1 22.0
United Kingdom 487.3 17.0 / 165.2 7.0
Continental Europe (incl. U.S.S.R.) 722.2 25.1 / 503.6 21.3
Asia 487.0 17.0 / 709.7 30.0
Africa 119.2 4.2 / 63.3 2.7
Oceania 85.0 3.0 / 34.7 1.5
All other 67.1 2.3 / 36.8 1.5
The Iron Age
Exports
Imports

FIG. 2 — Average annual value 1935 to 1939, of merchandise trade of the United States with foreign countries.

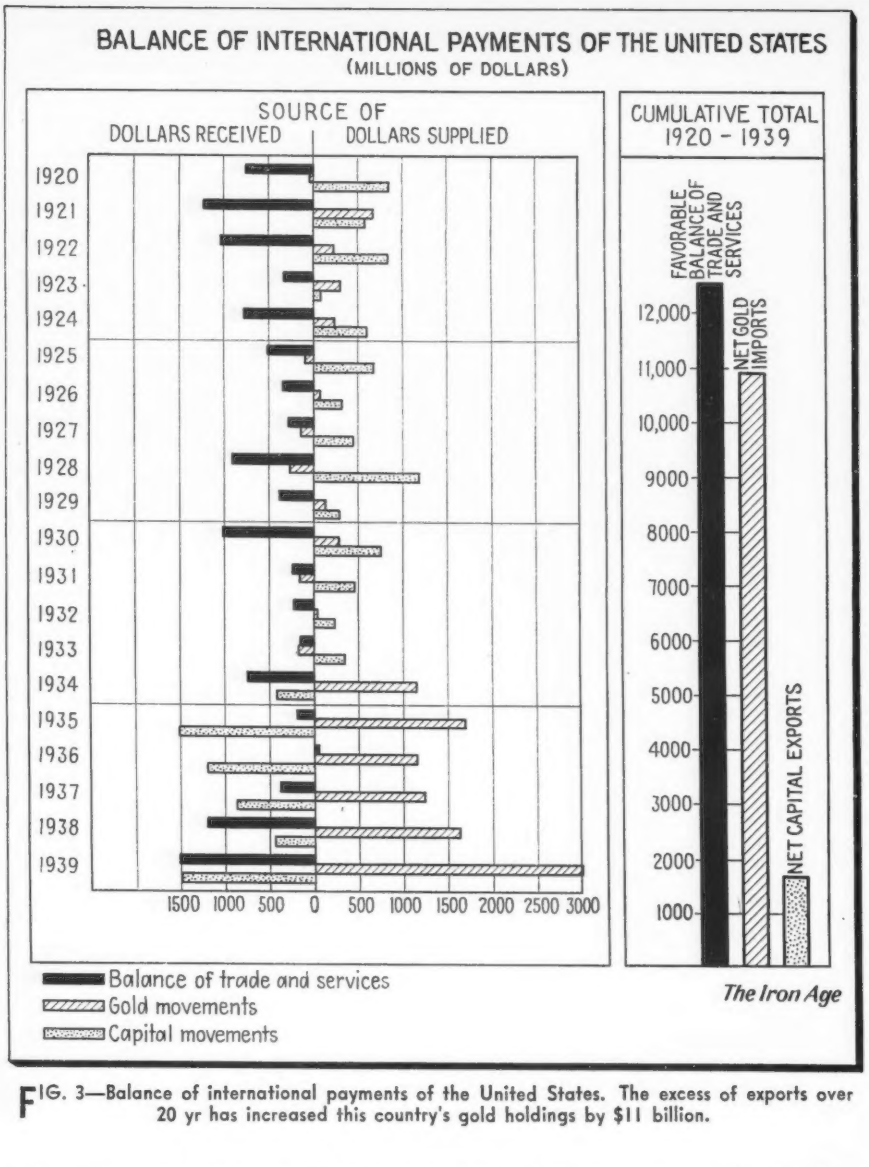


FIG. 3—Balance of international payments of the United States. The excess of exports over 20 yr has increased this country's gold holdings by $11 billion.

gency. In searching for a permanent and sound solution to world trade unbalance, vis-a-vis the United States, great care should be exercised in not confusing principles with their method of implementation. If the principles are not sound, then regardless of the efficiency of the methods of application, no fundamental solutions will be forthcoming. Consequently, the nation and the world are skeptical of the efficacy of such devices as the World Bank and the International Monetary Fund and recently granted foreign loans in curing the world's economic ills.

One is, therefore, by the logic of facts, brought to look for a solution of the balance of international payments to a more equitable and realistic relationship between American exports and American imports of merchandise and services. A sensible and permanent answer to the problem of international finance, as well as to the requirements of our national economy, can be found in a better balance of our merchandise trade, which means a healthier volume of foreign goods imported into the U. S. to counterbalance our shipments abroad. This is the considered opinion of several forward thinking business men whose opinions were sought on this vital subject.

The United States vitally needs foreign commodities. Our national resources are shrinking. We cannot put to work the gold we already possess and need no more of it. There are too few dollars to be repatriated now, and we have little use for indefinite promises of dollars 10, 20, or 50 yr from now. There is no logic or justification to accept, for the tangible goods we are requested and willing to supply to the world, anything but tangible goods of specific utility to our economy as a nation.

How can a policy tuned to these considerations be implemented? How can the U. S. nation get something, rather than nothing, from its exports, except "IOU's" or gold? Despite all criticism, gold has been, so far, the best form of "IOU" the world has ever known because up to now, it has always been ultimately convertible, the world over, into useful goods and services "at call." But this country alone, of all the important trading nations of the world, believes in the reestablishment of the traditional importance of gold in world economics. We alone remain prosaic and, unfortunately, stubbornly so, to our own detriment.

In the opinion of many business men the only sane and real road to obtain payment for the fruits of American farms and mills is to import greatly increased amounts of needed and desired commodities.

Some materials lend themselves to great expansion of imports, such as those absent from our soil, now in short supply or which is expected to run short in the not too remote future, or those of strategic and critical importance in time of national emergency.

A huge program of stockpiling of these materials could be developed in cooperation between private concerns and the government, without putting government back into business and preserving the lares and penates of the cult of free enterprise by surrounding their imports and marketing with opportune safeguards.

The stockpiled materials would thus become a part of our broad national economic defense and an insurance against disruptions to our highly industrialized economy by the machinations of a covetous world.

It is felt that the American public should understand and accept stockpiling for what is is; namely, an insurance of its future independence; American business should regard it as a guarantee of the continuity of its economic existence. And finally, we as individuals and as a nation would get something real, tangible and useful rather than elusive promises to pay, sometime, somehow.

Addressing the management division of the American Society of Mechanical Engineers in New York on Dec. 4, Assistant Secretary of the Interior

GOLD has been imported into this country in fantastic quantities and then buried at Fort Knox where it remains as a constant inflationary threat. The United States now has about 55 pct of the world's visible gold supply. This scene shows a shipment being unloaded on a New York pier.

C. Girard Davidson painted a gloomy picture of United States reserves of critical raw materials. He listed reserves of chromite, platinum and tungsten at 1, 2, and 4 yr, respectively. The bulk of the tungsten used in this country comes from China; imports, largely from Africa and Cuba, account for almost all our chromium; and during the war we imported more than ten times as much platinum as we produced in this country. Tin was not listed by Mr. Davidson because it must all be imported. Antimony reserves, set at 4 yr are also critical when one considers that while United States production is about a tenth of the world figure, imports in the prewar year 1939 were three times domestic output.

Until recently, exporters and economists were the only voices crying for the concentration of some serious thought on the balancing of exports with something other than gold or paper. To their cries, only faintly heard in the halls of American business and industry, has now been added a stronger voice. It is that of Secretary of Commerce W. Averell Harriman who has gone on record as favoring the development of imports, expansion of travel and encouragement of foreign investments to reach a balanced trade.

The announced purpose of the United States government today is the promotion of multilateral private trade under the free enterprise system as opposed to the growing emphasis elsewhere on state trading. But there is a strong feeling in some quarters that the encouragement of American investments in foreign countries should not be pushed too hard for they recall the billions that have been lost on such ventures in the past. The loss has not been confined to dollars; it represents production which might have gone to increase this nation's standard of living and in not a few cases it has been followed by unhappy political consequences and charges of dollar diplomacy.

The thoughts expressed in this article are not unanimous in the business and industrial community and only a handful of America's top flight businessmen have publicly expressed them. But they are shared by many whose thinking is years ahead. The United States, said one business leader, was the Arsenal of Democracy during the war. I believe, he added, that it is willing to become the Cornucopia of Plenty for the world—provided we get in return a realistic quid pro quo.

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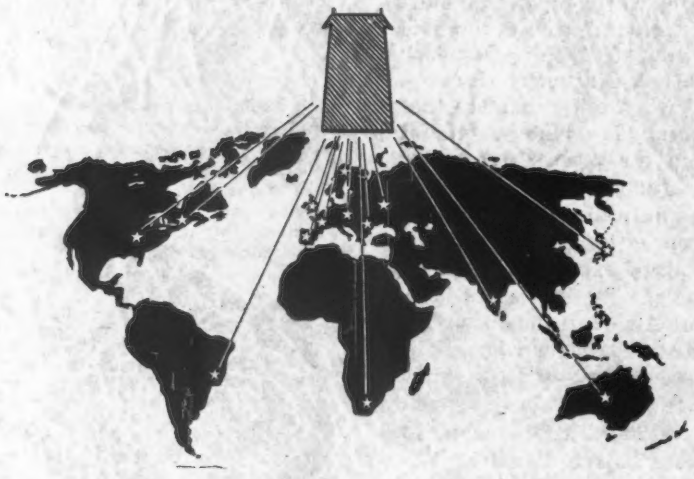
ABNORMAL conditions—the need to rehabilitate the devastated lands of our allies and of our former enemies—dominate large sectors of our foreign trade. For these exports, which often do not represent shipments to our normal markets, the United States receives little tangible return. World politics and a sense of moral obligation are the principal determining factors. This is a scene at Keelung, Formosa, where UNRRA steel cable is being unloaded to play its part in the rehabilitation of the Formosan coal mines.

WORLD STEEL PRODUCTION

Buffeted by the four plagues of present day Europe—labor shortages, raw material shortages, disruption of transportation and politics—steel production on the Continent is slowly and laboriously rising from the war end depths. Of the major producers, Russia and England have maintained wartime peaks, as contrasted with the 23 million ton decline in the United States. German output is but a tenth of the prewar level, while France is producing at a rate equal to 50 pct of its 1939 volume.



By J. R. Hight
European Editor
THE IRON AGE

THERE was a period in the development of steel production throughout the world when cost studies and the profit motive were the fundamental issues connected with the construction of new mills and the expansion of existing capacities. This phase in world steel history is rapidly drawing to a close and a new era is being developed by the force of political circumstance.

Just as America is pinning her hopes on the United Nations and her military planning on stockpiles and self-sufficiency, other nations are planning their heavy industries towards self-sufficiency, regardless of the cost. To wander far into steel history, most original industries were built on those sites where both iron ore and fuel or power were readily available. The evolution of the industry has been away from this straitjacket of geological manna, but the trend has been a slow one. New important factors of transportation for both raw materials and finished products developed, and the location of the consuming centers has become a question of major importance.

The dismal experiences of World War II have served to emphasize what was already a noticeable trend in the 30's towards the construction of steel industries with some form of government subsidy in countries where none had existed. Taken as individual case histories, the steel industries that have been developed on such a basis may be considered as small units, with little, if any, effect upon the industry of the world. Viewed collectively, the development of steel production in Turkey, Brazil, Chile, Argentina, Netherlands, Norway, Sweden, Eire, and other countries points the way to a world steel system in 1960 based on uneconomic nationalistic lines.

The total of the motives for this development is rather easier to list than to attach individually to the mills themselves. Fear is certainly the basic motivation for most of the action. Fear of World War III, fear of capitalist cartel exploitation, and fear of unemployment all might be included in this category. Whether voiced or not, the war fear is probably the strongest. Oddly, this motive is as strong among the ex-neutrals as it is among the ex-belligerents. The countries who fought in the last war do not care to see themselves without adequate steel for their own needs if war should come again, regardless of whether they fancy themselves able to stay on the outside. The neutrals, who had to do without their basic steel needs during the last war, are planning to have themselves lifted above this dependency for the next world conflict.

This fear lifts the hitherto fundamental question "Will a steel industry in country pay its way?" from the path, and makes it possible for the government to draw forth the shekels required for the work. From the standpoint of the people who will be employed in constructing the industries, and the operators as well, there is great wisdom in getting into a government purse for funds. Politicians all over the world are sensitive people, seldom able to admit errors. Thus, once the initial decision is made to establish a steel industry, there is no retreat. The Eirean experience at Haulbowline is a case in point. For the size of the operation, big sums have already been put up by the government, with scant results. There is still, after 10 yr of work, great difference of opinion as to whether the site should not be changed. But the government is only in a position to write off the funds that have been spent, and push forward with more work, and more funds.

Developments of commercial steel production in a government steel company in Sweden, another in Norway, and similar ideas in the Netherlands are all aimed at self-sufficiency. Although with more apparent justification, Russia, China, and the British Dominions are all headed toward ultimate self-sufficiency. The latter group will certainly develop a market sufficiently large to consume the production of a home industry, but the trend will not alter, regardless of whether the product could be more cheaply purchased abroad.

Brave Intent of UN

Despite the brave intent of UN to reduce trade barriers all over the world, governments are likely to be put in a position of protecting their investments in steel works. With the development of a new crop of sheltered steel industries in the smaller countries, the international market will become a cluttered complex of limited pockets where the whim of tomorrow's politicians will play a more influential role than price or quality.

The broad anxiety of many countries to absorb a portion of the lucrative international trade enjoyed by Germany before the war may also become an agitating factor in the expansion of steel production. Rumor has it that the major steel producing countries, including those which belonged to the prewar steel cartel, have already divided the spoils of the German demise among themselves on the basis of an informal gentleman's agreement. Whether or not such an agreement has been achieved, clouds are appearing in the form of outsiders determined to share in the market.

Despite the expansion of steel production which took place between 1939 and 1945, the past 12 months have been a period of steel famine directly due in part to the physical disasters of the war itself, and also to the economic disruption brought about by the war. The most disappointing aspect of the worldwide seller's market in steel during 1946 has been the failure of the American industry to produce anything approaching

TABLE I
World Pig Iron Production[1]
(Thousands Net Tons)

	1946	1945	1944	1943	1942	1941	1940	1939
United States	45,450	53,200	62,073	61,895	60,115	56,070	46,979	35,396
Germany	2,024	4,400	20,990	26,718	24,506	23,561	17,136	20,363
Poland	799	65	76	118	106	85	.....	.....
Belgium	2,292	650	623	1,802	1,386	1,569	2,494	3,444
France	3,571	848	1,214	2,345	1,746	1,443	5,192	8,625
Luxemburg	1,454	425	.....	.....	.....	.....	.....	1,962
USSR	20,000	18,800	16,800	11,100	7,700	14,300	16,500	16,700
United Kingdom	8,779	7,840	7,421	7,919	8,300	8,145	9,042	8,794
Japan	157[2]	552	2,820	4,184	4,530	4,496	3,758	3,374
Canada	1,407[3]	1,793	1,852	1,758	1,975	1,528	1,309	846
Sweden	740	950	903	872	813	787	672	700
Spain	540[2]	540	680	659	638	595	550	548
Brazil	309	236	265	225	195	190	205	165
India	1,666	1,545	1,599	1,975	2,069	2,284	2,257	1,975
South Africa	588	618	509	524	403	349	336	336

[1] Includes charcoal iron and ferroalloys made in blast furnaces. [2] Last 6 months estimated. [3] Does not include ferroalloys.

the 90 million tons of steel which was the peak output during the war years.

Following closely after the loss of about 24 million tons of steel output in the U. S. is the gap left in the world steel market by the war in Europe, which has resulted in a 1946 production of steel in the British Zone of Germany (80 pct of total) amounting to approximately 8 pct of the peak German war capacity. The aftermath of the European war has also held the French, Belgian, Italian, Polish and Russian steel production to far below theoretical capacity. The bright spots, on the other hand, in the 1946 production story are to be found in the United Kingdom and the industries in the British Dominions and Sweden.

A comparison of prewar and postwar steel production of the principal producing countries is given in fig. 1. Table I lists world production of pig iron from 1939 to 1946, while table II shows world production of steel ingots.

It is becoming increasingly difficult to arrive at an accurate indication of the theoretical capacity of the various steel industries, due to the wide variations of circumstance in which they find themselves. There is no wide agreement on what prewar years may be considered as average, and many countries have today existing steel capacity for which they lack sufficient raw materials or labor, or which is so obsolete that it must undoubtedly be largely written off.

Although comparatively little work has actually been accomplished in the past year, it seems evident that the eventual postwar steel production-distribution pattern as far as the Western European countries are concerned will be altered in many respects, although the position remains essentially the same as it was a year ago. Until the major powers have arrived at a set of fundamental conclusions as to the future economy of Germany, other European countries are unable to arrive at any quantitative conclusions as to the expansion of their various steel product lines.

United Kingdom:—Fuel shortages have constituted the primary hazards to United Kingdom steel production and, in addition, in certain sections, labor, during the past year, but despite their incidence British producers have managed to maintain a comparatively un-

TABLE II
World Ingot and Castings Production
(Thousands Net Tons)

	1946	1945	1944	1943	1942	1941	1940	1939
United States	65,900	80,100	89,642	88,836	86,032	82,839	66,983	52,799
Germany	2,746	5,500	28,481	33,706	31,684	25,804	23,732	26,152
Poland	1,274	150	184	284	262	240	.....	1,345
Belgium	2,400	550	622	1,862	1,578	1,835	2,520	3,200
France	4,570	1,280	1,407	2,662	2,429	1,658	6,160	9,260
Luxemburg	1,381	358	.....	.....	.....	.....	1,451	2,016
USSR	21,500	19,800	15,400	13,300	12,200	16,600	20,100	20,600
United Kingdom	14,372	13,238	13,422	14,361	14,263	13,568	14,300	14,571
Japan	547[1]	1,173	6,433	8,616	7,748	7,528	7,541	7,365
Canada	2,370	2,800	3,024	2,995	3,121	2,701	2,255	1,326
Sweden	1,290	1,350	1,322	1,337	1,360	1,283	1,280	1,300
Spain	709[1]	600	706	660	602	609	540	537
Brazil	273	205	199	167	145	140	155	145
Mexico	262[1]	209	201	.....	110	107	110	80
India	1,505	1,518	1,532	1,572	1,505	1,572	1,451	1,269
South Africa	491	591	537	456	376	376	403	349

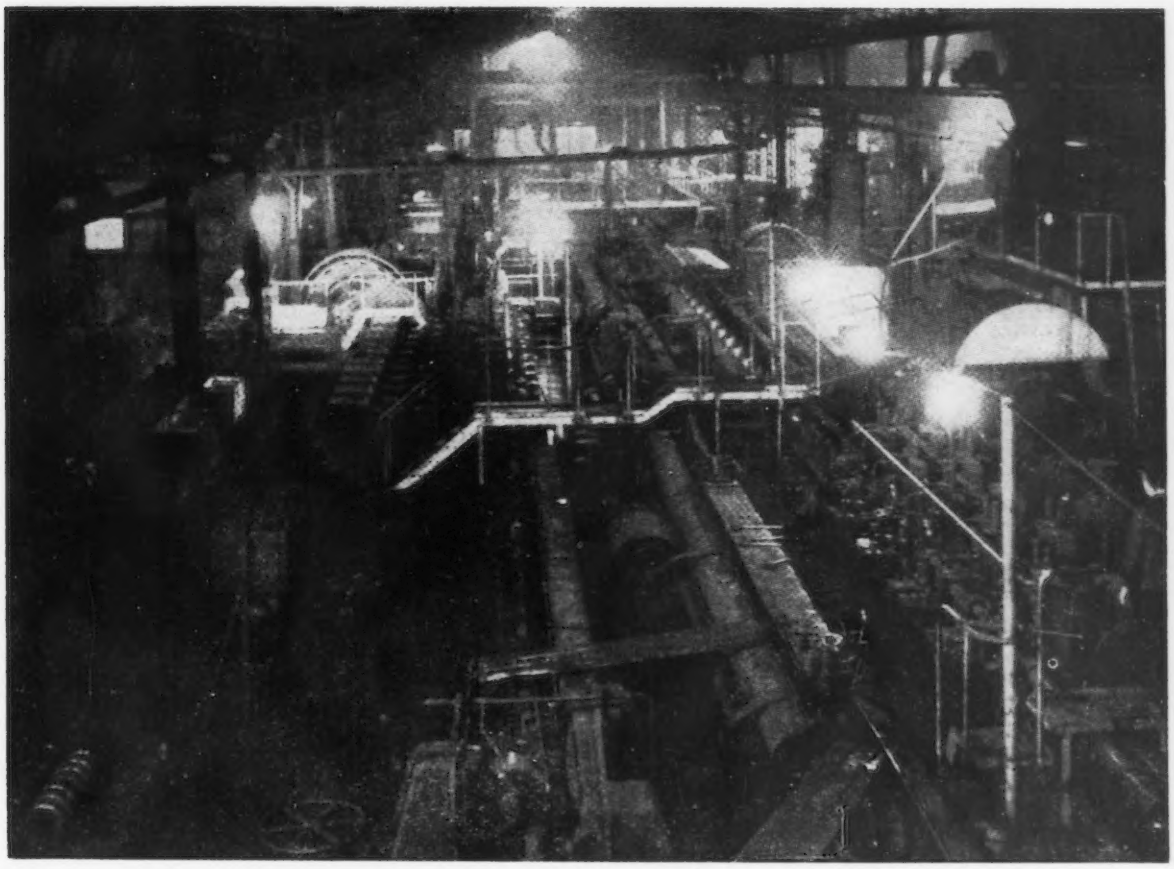
[1] Last 6 months estimated

interrupted production schedule throughout the year. Monthly production varied from a low of 1 million net tons during the holiday month of August to a peak of 1.3 million during January. The total figure for the year amounted to approximately 14 million tons, including an estimate for December.

The figures for 1946 represent some improvement on the wartime years, made possible by resumed importations of foreign ores. The foremost problem facing the British steel industry at the end of 1946 was the nationwide shortage of coal, which was actually controlling production in some works, and threatened to curtail it in others. Although the shortage of coal in Britain may be properly considered as a part of the international shortage, at least as far as the British Isles are concerned it can be more specifically called a purely domestic problem. In prewar years England counted coal among her biggest exports, but British production slipped so badly during the war years due to a shortage of miners and a reduction in the productivity of labor that, although token exports have been maintained during the past year, the British Isles are actually producing insufficient coal for their own needs.

The steel industry is probably suffering rather less from this fuel shortage than are certain other consumers, as the distribution is rigidly controlled and the government has recognized the fundamental nature of steel production. The fact remains that steel firms who had been keeping their fuel consumption at as low a level as possible during the first 11 months of 1946 were given a 5 pct cut January 1, and will consider themselves to be fortunate if they are not required to take more substantial cuts before this winter is passed.

The labor shortage has been of a selective type, due primarily to a reluctance on the part of most workmen to return to hot, dirty jobs in the industry. A particular problem has been posed in the efforts of the steel industry to reopen the tinplate and hand sheet mills where production was concentrated and many units closed down during the war. Due to a feeling on the part of most workmen that the advent of new continuous hot strip mill production in England will result in the end of these industries, there has been a great reluctance to take such jobs.



TYPICAL of efforts of governments to reshape the steel industry are those of Sweden where the government is urging greater production of ordinary tubing by mills previously concerned with fine steel production.

The last months of the year have begun to show some steady gains with respect to the tinplate side of the business, and it is hoped that the first quarter of this year will see another 10 pct increase in tinplate output. The situation in the hand sheet mills is not so bright, and, although exact figures are difficult to obtain, it seems likely that sheet output could be increased by 25 pct if labor were available in South Wales. A shortage of freight cars is also causing the steel industry some embarrassment, and there were occasions at the end of the year when specific plants were actually closed down to permit the railways to catch up on shipments. This condition is rather more of a short range nature than the coal and labor problems which are apt to prove long term headaches to the United Kingdom steel firms. It is generally expected that

the freight car shortage will begin to clear itself up by the middle of 1947, but progress in other lines may be slower.

Despite a shortage of steel which is causing some considerable embarrassment to the government as well as restricting the all-important export drive, the expansion of British production during 1947 will probably be limited to about a half to three quarters of a million tons. Efforts will be made to push this year's figure as high as possible, but there is no possibility that any substantial amount of the 5-yr development plan detailed during 1945 will actually be in production in time to affect 1947 statistics. The increase in output which will be accomplished will be brought about largely through the availability of increased amounts of coal, a slowly increasing availability of labor, and the utilization of some electric furnaces which were idle during 1946 for commercial production. There are certain problems, however, connected with the production of steel in the electric furnaces which will multiply as these units are brought into operation, as there is in many cases a shortage of installed capacity in the regions where war-built units are located now that domestic consumption is more or less unrestricted. Efforts are being made to expand the electric installations, but deliveries of the required equipment are very slow.

The past year saw the plans for the modernization and development of the British industry, as drawn up by the British Iron & Steel Federation, discussed in public and then submitted to a newly appointed Iron and Steel Board for its approval. This program, which is designed to expand British production to almost 18 million ingot tons by 1951 has suffered serious delay due to the political factors revolving around the determination of the British Government to nationalize certain basic industries. Unfortunately, the arrears of modernization which have accumulated during 6 yrs have been delayed since the end of the European war until fundamental assurances are received as to the ultimate future of the industry, and there is considerable possibility that these delays may reach well into 1947. A precise determination of exactly how much the delay amounts to would be difficult to attain, because the usual amount of maintenance and repair work is going forward ,and certain modernization projects are also being started. The Steel Board, which has only functioned for 3 months, is still engaged in studying the federation plan, and, although the fundamental conclusion that the general idea is good has already been reached, the board certainly is reserving for itself the right to alter in certain respects much of the program.

French Industry Recovers

France:—The recovery of the French steel industry from a complete stoppage at the time of liberation seemed a painful, almost hopeless job at the beginning of 1946. Although much criticism has been leveled at the French people for their retarded reconstruction, there can be no doubt that the steady increase in pig iron, ingot and finished steel production represents a real triumph over an acute shortage of fuel and a regrettable mixture of government control effected through several interim governments of varying political color.

Following an average monthly production of 152,000 tons of steel in 1945, production increased during 1946 to 523,000 tons in October. Rolled product output rose during the same period from 102,000 tons to 369,000 tons. The production for the month of October represented 92 pct of the average monthly ingot production of 1938, while the rolled product output totaled 98 pct of the 1938 average.

Due to the reduction of the importation of coal and coke during the last 2 months of the year, steel production leveled off in November and December to an estimated 3,800,000 tons of pig iron for the year, 4,900,000 tons of steel, and 3,400,000 tons of rolled products. The approach of the production rate at the end of 1946 to a par with 1938 production is not considered by the French industry to be anywhere near the ultimate goal inasmuch as 1938 was a low production year, and in addition the large accumulated demands have greatly expanded the essential needs for steel for the reconstruction of France. The industry is anxious to push on as soon as possible to a production rate of about 10,600,000 tons, which is equal to the 1929 rate.

Although French production of coal and coke expanded greatly during 1946, the steel industry must depend largely on imported material, and this dependence has been the primary weakness of the French industry during the year. The historic source of French coking coal and coke is the Ruhr, but reconstruction work in Germany has progressed so slowly that French officials are of the opinion that the British occupation of the Ruhr has been badly managed. French sources are not the only group who express this opinion, as the other Western European countries who would like to have greater imports of good Ruhr coal are resenting the dwindling of the export program.

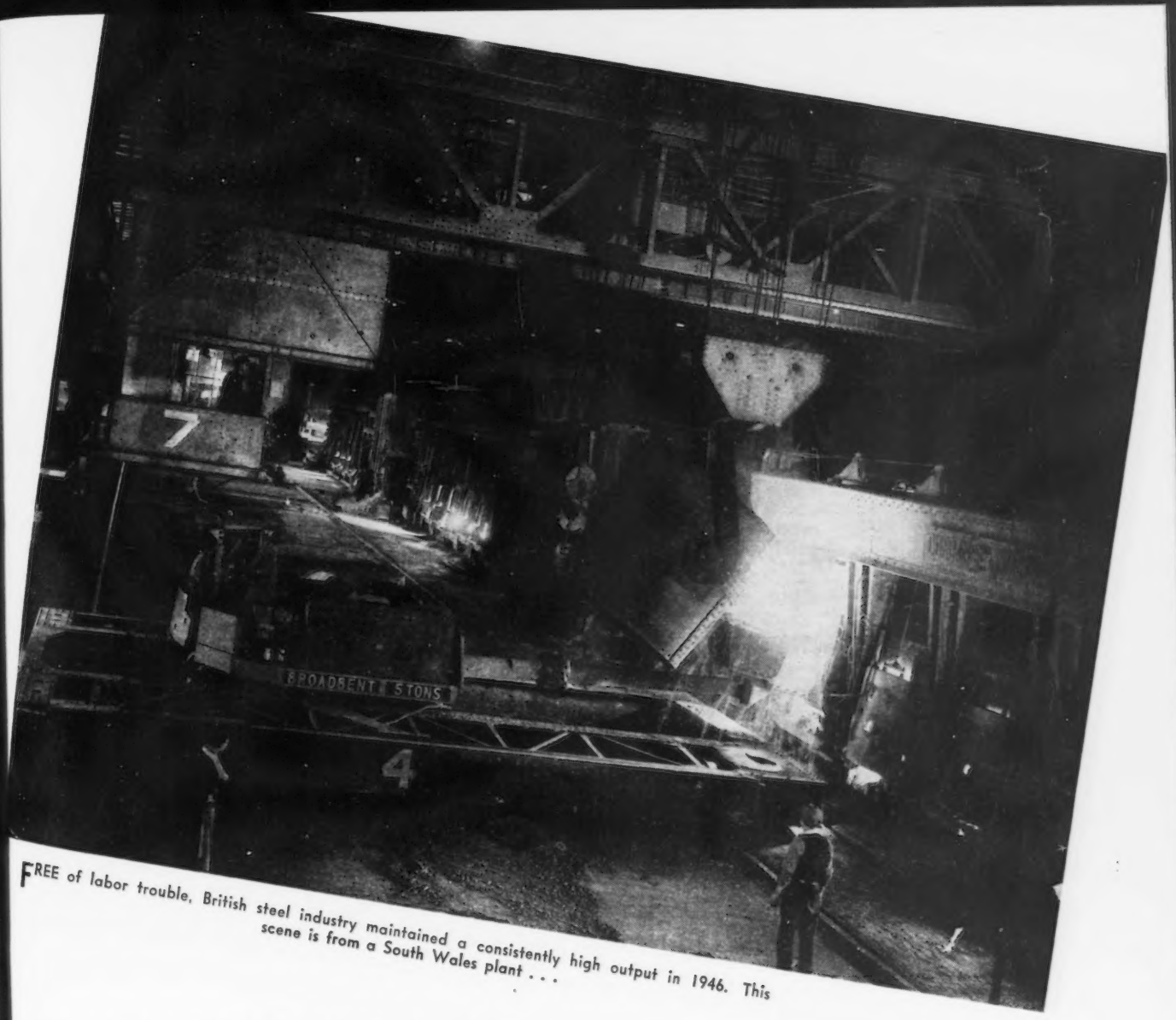
The Ruhr exports, which were somewhat sporadic throughout 1946, grew definitely smaller as a matter of British policy late in the year, and French officials feel that the way is being prepared for a complete stoppage early in 1947. The allocation program established by the Ministry of National Economy called for 770,000 tons of coal and coke for the steel industry in November of last year, and an increase of 55,000 tons for the last month, but the dereliction of American supplies and the shortage of Ruhr shipments interfered with these plans. Arrangements concluded in the early part of 1946 for the increase of shipments to France from Poland, which might have played an important part in the program, were also disrupted by inflation of the cost of the goods which France was sending to Poland in return for the coal.

The mining of French iron ores, which dropped from over 50 million tons in 1929 to about 7 million in 1945, has recovered to about 55 pct of the prewar rate and is providing ample stocks for the needs of the French industry, as well as for export. Pig iron prices were increased by about 30 pct during the year and finished steel prices about the same, but prices remained controlled.

British Zone Output Highest

Germany:—The British Zone saw the largest share of the steel which was produced in Germany in 1946, with the remnants of the Ruhr industry sending forth the grand total of 2,746,000 net tons during the year. The story of the limitation of German production during the year is a simple and consistent one. From the beginning of the year to the end, coal was the controlling factor.

Although the four occupying powers did see fit early in the year to set an upper limit on German steel production under the terms of the Potsdam agreement,



FREE of labor trouble, British steel industry maintained a consistently high output in 1946. This scene is from a South Wales plant . . .

output never approached the 540,000 net tons which would have been required per month to reach the 6.5 million tons permitted by the Allies. The peak month was August, when 275,000 tons were produced, but, due to a sudden disruption in the coal supply, this rate could not be maintained.

The first half of 1946 saw production resumed temporarily in most of the Ruhr mills, particularly for the purpose of using up local stocks of fuel and semi-finished material. This process continued throughout the year, but on a scale that is difficult to assess. There was a continuous record of plants opening and closing, with some consequent unrest among the German people, and a vast amount of worrying about the dismantling of plants for reparations, although practically no dismantling was done in the Ruhr.

British officials hoped in the middle of the year to push the annual production rate up to 4.8 million tons by the end of 1946, but the fuel problem prevented this accomplishment. Due to the growing conviction among British officialdom that no adequate recovery could be made in Western Germany until more steel is made available to the mines and the industry and railways, the exports of coal and coke from the Ruhr were under constant fire during the last half of 1946, and it seems likely that the tonnages of coal and coke from the Ruhr shipped to other countries during 1947 will slowly dwindle away to virtually nothing by March. The germ of the idea was carefully sown by the occupation authorities in the middle of last year, and 6 months were whiled away in gradually breaking the news to Belgium, France, and Luxemburg that they were about to be cut off. Whether this action will take the form of a clear-cut embargo on German exports early this year, or the policy of attrition is continued, the result will be about the same.

For every ton of high grade coking coal that is used domestically from former export allotments there will be a corresponding drop in the production of some other country. Thus, the balance of European production seems likely to swing in favor of Germany in 1947. The intention of the British officials in fostering such a swing is to effect the better long range recovery, at least of Germany, if not of all of the Western countries. The idea is that if production is diverted to German industry, the mines will be able to produce nearer prewar tonnages, and then, in turn, exports will be able to be resumed on a greatly expanded scale.

The most probable snag in this well laid plan is that a serious manpower problem is certain to develop in

the German steel industry this year when greatly increased amounts of coal become available. Labor began to be very short in August when last year's production peak was hit, and a sudden spurt this year will certainly pose the same problem. British officials hope that the level of industry limit for the German steel industry will soon be increased to about 11 million tons, and with this a long range goal to double the 1946 output during this year. The labor problem will probably develop seriously when production gets up to about 350,000 tons per month. Above that figure it will be a fight every step upward, as the facilities for shifting labor about are lacking, and recruiting programs have been largely unsuccessful.

Theoretically it should be possible for Germany to produce sufficient domestic ore for the 1947 production goal to be reached, but in actual practice, if other factors favor such a high steel rate, it will probably be necessary to import the ore, as production in the ore mines of the French Zone is not expected to increase rapidly enough to double present output. Inasmuch as the British Zone also depends almost completely on the French Zone for its refractory material, the British military government staff will be forced to dish up the unpalatable coal export cuts in a form that France will swallow, or the latter may choose to be reluctant with supplies of refractory brick.

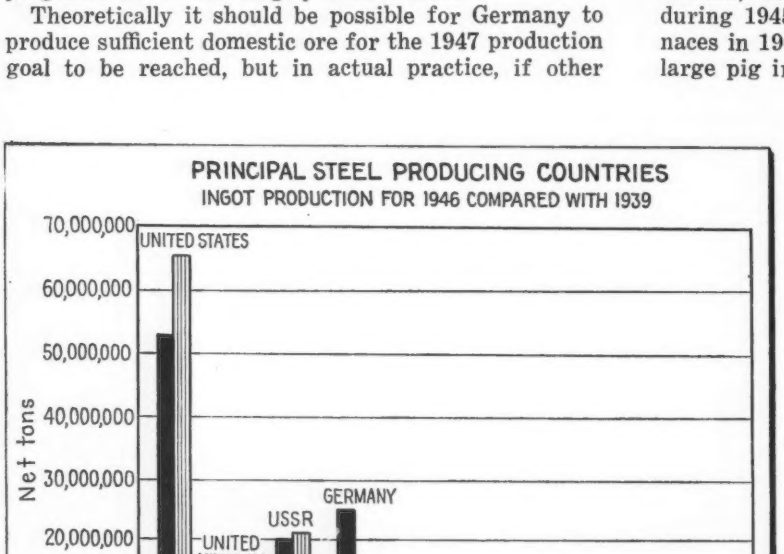


FIG. 1—A comparison of prewar and postwar steel ingot production of the principal producing countries.

Belgium:—The coal and coke shortage constituted the primary controlling factor in Belgium steel output during 1946 and promises to remain as the important limitation in 1947. There was a sharp recovery in 1946 output to 2.5 million net tons, compared with 550,000 tons in 1945. Striving to regain its prewar place in the export market, Belgium exported about half of this production as direct steel shipments, and much more of it indirectly in finished manufactured products produced within the country.

An effort was made to keep orders low and thus be able to ask for high prices on the basis of short delivery times but met with mixed success. In contrast to prewar, when Belgian costs were considered to be among the lowest in the world, the labor and material items have gone up extensively and producers are somewhat worried about their competitive position.

It is known that the Belgian industry is planning a broad modernization program along with a certain amount of expansion, hoping like so many other countries to capture a share of the old German markets, but no details have been disclosed. A new powerful trade association will probably be instrumental in forcing the acceptance of the dislocations caused by such rearrangements.

Netherlands:—Production of pig iron in The Netherlands, which was resumed in a first blast furnace during 1945, expanded into the second and third furnaces in 1946, starting the nation back on the road to large pig iron exports. Rolling mill facilities ordered in Germany before the last war and diverted to the Goering Works were delivered to Ymuiden and will be used primarily to supply the Dutch shipbuilding industry.

The ambition to become self-sufficient is also dominating the thinking of Netherlanders, and plans are being prepared to expand output to handle the increasing demands of Dutch industry. Recovery is being seriously delayed because industry was tied so closely to Germany before the war and depended largely on German tools, machinery, and spare parts.

Czechoslovakia: — The opportunity to study the first results of nationalization in the Czech steel industry is irresistible, but cannot be called conclusive. Production of approximately 1,700,000 net tons during the year comes within 100,000 tons of the 1938 production. The monthly production rate grew steadily throughout 1946, but due to the dislocations of war the companies showed a loss for the year. (Few of the European steel companies who were occupied during the war made any money last year.) Principal ore supplies during 1946 came from Russia, but high grade Swedish ore began to appear in the last quarter.

Ambitious plans for the next 2 yr drawn up by the Czechoslovak Government call for a 25 pct increase in the production of pig iron this year and an 18 pct increase in ingot production. In its analysis of plans for next year, the government has gone so far as to indicate which of the new national combines can be expected to break into the profit column next year, but iron and steel is not included. Following a scheduled expansion of steel output to 2.4 million net tons for this year, the Czech 2-yr plan calls for a 1948 goal of 2.8 million.

The existing steel plants have been grouped into six national companies, Vitkovice Iron Works, United Steel Works, Mining & Foundry Co., Kovohute, Bohemian Rolling Mills, and Moravian Rolling Mills. A general directorate in Prague handles the purchase of raw materials for all, the collection of scrap, and sales. Six product sales organizations have been formed in Prague to specifically handle the latter.

Sweden:—Expansions in Swedish carbon steel production are being planned to eliminate the shortage of

steel which was so acute during the war, and which hung over to a lesser extent during 1946. Ingot production during last year totaled 1,290,000 net tons, which represents approximately 200,000 tons of war-built capacity. Pressure was heavy on the Swedish traditional producers of fine steels, to the distaste of the companies concerned, to increase the output of ordinary carbon steels for the needs of the construction and shipbuilding industries.

The fuel shortage continued to harass Swedish producers as the No. 1 production problem, and at the end of 1946 the industry was still consuming far more wood for fuel than coke. Fortunately, the warborn necessity of using straw for furnaces no longer existed, but the expensive use of big tonnages of wood will go on into all of this year. In addition to the added expense of using wood fuel, the woodcutting and handling only aggravates the secondary production problem, the labor shortage. There is hope, however, that the second and third quarter of 1947 will see considerable improvement in coke shipments.

Since the volume of wood to be handled is several times as great as the equivalent heat in coal would be, the amount of labor expended in the handling is large, and the national Swedish labor shortage is pressing down on steel, as well as other industries.

Italy:—Italian production in 1946 reached 89 pct of the 1942 rate, despite a shortage of coal imports and power due to a deficiency of rains. Coal imports for steel amounted to about 50 pct of prewar tonnages and will probably fall to a lower level in 1947. Dependence is placed on electric steel production due to the coal picture. In 1936 approximately 20 pct of the output was electric steel. It is now 60 pct. Present steel demand in Italy is about 124,000 tons monthly, compared with 200,000 before the war, but industry cannot meet the demand regularly due to seasonal losses in electric plants.

Canada:—A strike in the middle of the year brought the Canadian production rate down to approximately 66.5 pct of rated capacity. The estimated ingot tonnage is 2,370,000 for 1946, 1,407,000 tons of pig iron, and 2,000,000 tons of finished steel products. The strike, which lasted for 81 days, came to an end on October 3, but ingot production continued to be hampered as war-delayed repair programs were undertaken. The strike served, as did those in America, to multiply an already difficult steel supply situation.

Russia Sets New Goals

Russia:—The Soviet Union remains the world's most important steel enigma. Published figures on Russian steel production show wide variation, but if the actual production is hidden, the world is furnished almost annually with a new set of goals for the expansion of the industry.

The latest set is for 1950, and indicates a target of 28 million net tons of ingots and castings, plus an ultimate target of 66 million net tons of steel capacity to be achieved in three 5-yr plans. Educated guesses on the 1946 production indicate that about 21.5 million tons would be a fair tonnage. This compares with 20 million said to have been produced the previous year.

The only statement made by Moscow since the advent of the March 1946 5-yr plan was an indication at the end of the third quarter of last year that the goals had been reached, but of course greater efforts would be required to achieve similar success in the following period.

The principal items of the current 5-yr plan are 45 blast furnaces, 270 steel furnaces, and 104 rolling mills.

Brazilian Output Rises

South America:—Ingot production in Brazil for the past year totaled 273,000 tons, as compared with 205,000 tons in 1945. Industrial activity in 1946 was slowed somewhat by the same material shortages which affected the United States. Many of these shortages in Brazil were the indirect result of failure to deliver material and equipment from the United States. The metalworking fields especially showed sharp gains in the latter part of 1946. Some metal industries, especially aluminum and other nonferrous products, showed output rises during 1946 as high as 200 to 300 pct over 1940. On a dollar voulme basis, the expansion was still greater, although part of it was due to higher prices.

While United States firms still have the edge on European countries because of war induced situations, there appears to be an absolute necessity for a better understanding of the Brazilian industrial problem by North Americans if the latter are to retain the business advantages which have been granted them by a large part of the Brazilian industry. The major weakness in business relationship between the United States and Brazil is the failure of the former to adequately train sales and engineering representatives before they are sent to South America. European firms are past masters in the art of carrying on good relations with South America.

Work went forward in Chile on the integrated steel plant under construction at Concepcion during 1946, but operations are not scheduled until 1948. The development is designed to utilize cheap hydro power, and will include an openhearth, an electric, and a bessemer furnace.

Argentina is going forward with plans to construct a national steel industry to go forward in two sections. Steelmaking and rolling facilities will be constructed in the first instance to use imported pig, and at a later date all of the pig iron capacity required for domestic needs will be constructed. According to recent reports there has been no general anxiety on the part of private investors to invest in the project, but the government is expected to arrange the financing.

METALLURGY

Facing the heavy responsibilities of peace, metallurgy found 1946 a year of many challenges. Meeting the new demands of design engineers, and at times apparently anticipating them, resulted in many significant accomplishments during the past year. While many of these advances are outgrowths of wartime research, the reshaping of the materials to meet the economic requirements of peacetime competition has called for much skillful effort. Important new knowledge was reported in, to name a few fields, high temperature metals, high temperature ceramics, the light metals, powder metallurgy, inspection and testing, and in hardenability concepts.

By E. S. KOPECKI
Metallurgical Editor
THE IRON AGE

THE year 1946 has indeed been fruitful from the standpoint of technological advances made in the field of metallurgy. New materials have been disclosed; processing techniques have been improved; metalworking equipment has been advanced; and inspection and testing apparatus and procedures have been developed.

The gradual return to normal peacetime competitive economy carries with it the requirements for increase in production and quality of product. Forgings, castings, die castings and metal powders must once again vie for favor, not only in an economic sense, but metallurgically also. The rapid progress that has been made in testing methods and apparatus has focused attention on the producer and the fabricator, and has challenged them to improve industrial techniques.

It is impossible, of course, to even attempt to mention all the developments that merit attention, in a brief summary such as this. However, some of the technological advances that have aroused considerable interest during the past year are critically reviewed.

High Temperature Alloys

One of the most dramatic developments to rise from the wartime years—if the deluge of reading material to which the 1946 metallurgical world has been subjected can serve as the criteria—is the socalled high temperature alloys for turbosuperchargers, jet engines, gas turbines and rockets.

The alloys studied were divided into seven basic classes, including: (1) chromium-nickel-iron, (2) nickel-chromium-iron, (3) nickel-chromium-cobalt-iron, (4) nickel-base, (5) nickel-chromium and nickel-chromium-cobalt-iron (titanium and aluminum hardened), (6) cobalt-chromium, and (7) cobalt-chromium-nickel, alloys. The initial temperature of interest was stated to be 1500°F, and the materials with creep rates not exceeding 0.00001 pct per hr at 7000 psi were desired. Later, the scope of the work was broadened to cover 1350° and 1600°F and some alloys were tested at 2000°F.

This research, carried out under contract with the Office of Research and Inventions, Navy Dept., concerned ceramic materials as well as metals. Work is now said to be in progress with the use of alumina, beryllia and zircon. Possibilities have been pointed out as definitely promising for ceramics to be utilized for high temperature regions where metallic alloys are no longer serviceable.

Inherent brittleness is a serious deterrent to the use of ceramics at high temperatures, and this, coupled with their relatively high thermal expansion and poor thermal conductivity, make them more sensitive to thermal and mechanical shock than one would desire. The fact should not be overlooked, however, that the high temperature metallic alloys also are much more brittle than are common metals. The Bureau of Standards has placed emphasis on beryllia because of its remarkably high thermal conductivity. Also, in applications such as turbine blades involving centrifugal forces, the relatively low specific gravity of beryllia (approximately 3) offers a three to four fold advantage over the heavier metallic alloys and, at room temperature, the strength is ample for most purposes. Bodies high in beryllia content can be obtained readily with compressive strengths in excess of 200,000 psi. There is, in addition, every reason to believe that minor percentages of oxides may have an inordinate effect in ceramic alloys just as minor additions of metals affect metallic alloys.

In 1941 work was started at the National Bureau of Standards on simple oxide bodies to establish whether or not formulations could be developed which would mature in available commercial kilns without too great a sacrifice of strength. For convenience, exploratory tests were made by stressing the specimens in bending. The average value at 1500°F for bodies containing about 85 and 90 pct beryllia, matured at from 2800° to 2900°F, was about 24,000 psi. Values for bodies containing 65 and 80 pct zirconia average about 32,000 psi at 1900°F, but the resistance to thermal shock is not as good as that shown by the high beryllia compositions. These high zirconia specimens also were matured at 2800° to 2900°F. The best single value was 36,000 psi at 2000°F.

Strengths in Pure Tension

Strengths in bending were quite suitable for culling out the definitely weak bodies, but they did not answer the question of the designers of gas turbines for airplanes. They wanted to know strengths in pure tension, because the dominant stress in a turbine blade is tensional.

The best tensile strength value so far for a single specimen is 20,000 psi at 1700°F. These bodies are all very resistant to deformation, or creep, at temperatures up to 1800°F. At 1700°F, for a body containing about 65 pct zirconia under stresses ranging from 14,000 to 20,000 psi over a total test period of nearly 2800 hr, the total extension, both elastic and permanent, was a little over 0.28 pct. At 1800°F, for a body containing about 85 pct beryllia under stresses ranging from 9000 to 14,000 psi, during a total of about 2600 hr, the total extension was 0.23 pct. The effects of stress and time of stress application on elongation is indicated in fig. 1. The specimen had not failed and was later subjected to two short-time tensile tests in which it withstood over 18,000 psi at 1800°F. A markedly different behavior is evidenced at 1900°F, where a stress of 8000 psi produced a creep rate of 0.0023 pct per hr. Even so, this specimen remained intact for 80 hr and elongated less than 0.2 pct. Fig. 2 illustrates the ceramic

tension specimen and ceramic adapters for applying stress.

Another intriguing story which has by no means been told, but which has suddenly begun to unfold, is the use of relatively high purity oxygen (90 to 98 pct) and of air enriched with oxygen, in (1) the production of pig iron in the blast furnace, (2) the melting of steel in the openhearth, (3) the bubbling of the gas into molten steel for refining and carbon reduction, (4) the smelting of nonferrous ores, and (5) the production of sulfuric acid.

Early in the year a report of Irving Langmuir's trip to Russia was published, wherein the author reviewed work being done in th t country on the high scale production of oxygen and its use in steelmaking. Reference by Langmuir to a Russian publication *Oxygen* initiated quite an undercover scramble in this country to secure copies of the magazine. A select few who finally did manage to beg, borrow or steal copies of *Oxygen*, expressed a disrespectful attitude for the data found therein. Not only were the curves qualitative—that is, coordinates were without units—but the experimental conditions and results reported were, to put it mildly, claimed ridiculous.

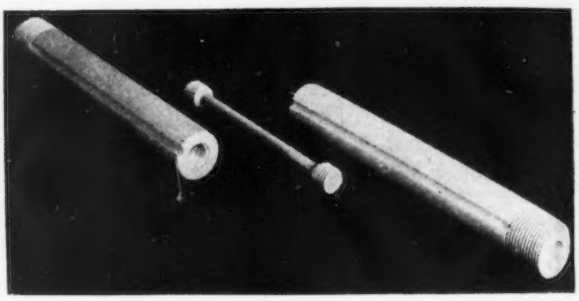
Suffice it to say that sufficient information found its way past the iron curtain to convince those "in the know" that work being conducted on this continent is at least on a par, if not superior, to that conducted anywhere else in the world.

The largest amount of experimentation with oxygen on this continent was concerned with the melting of scrap in the openhearth furnace. The advantages in time and fuel saving have already been made apparent. The next factors to consider are the cost and availability of oxygen as well as the effects of the high temperature on furnace refractories.

It must, of course, be emphasized that the advantages of utilizing oxygen in melting scrap cannot be realized unless existing scrap-charging facilities are markedly improved. Damage to furnace refractories, due to the increased temperatures arising from the hot flame and rapid oxidation, can be greatly minimized if some unmelted scrap is present in the bath during the oxygen blow. This necessitates a reduction in scrap charging time in order to keep pace with the rapid melting.

Another application of oxygen that has created widespread interest is in introducing it into molten steel to effect carbon reduction. Fig. 3 illustrates the effects of time of introduction and rate of introduction of oxygen on carbon and manganese reduction, in the openhearth furnace. Another use, that of bubbling oxygen through a lance, in the production of stainless steel in the electric furnace, was recently described. Rather than introduce the oxygen into the molten bath, however, it was fed to the slag-metal interface. An average time of oxygen usage, 138 min. (average for 10 heats) resulted in the consumption of 300 to 400 cu ft oxygen per tapped ton of steel, depending upon the carbon content. Temperature control is more difficult when using oxygen; however, the increase in bath temperature is said to be highly desirable since at higher temperatures, carbon is oxidized more readily than chromium.

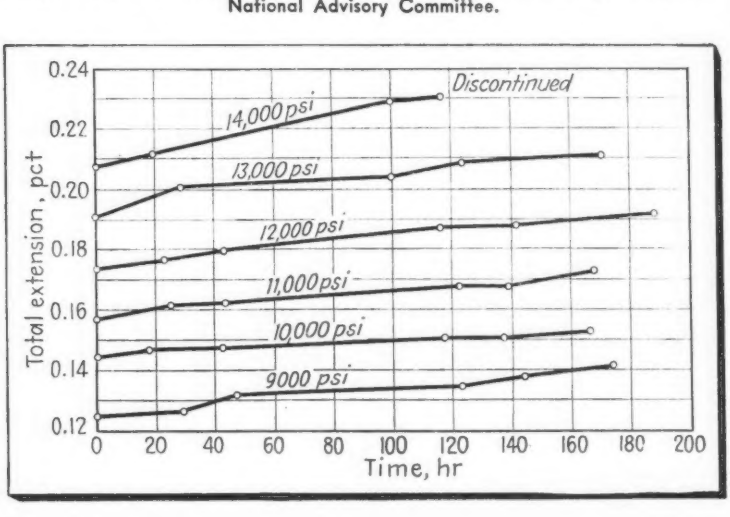
FIG. 2—Ceramic tension specimen, and ceramic adapters for applying stress, manufactured by the Champion Spark Plug Co. using the rubber mold process and a porcelain body developed at the National Bureau of Standards. Gage length of tension specimen is approximately 0.3 in. diam by 5 in. long.



Up to the time of the Carnegie-Illinois announcement regarding development of a precipitation-hardening 18-8 stainless steel (designated as Stainless W), the desirable combination of hardness, high strength and corrosion resistance of 18-8 had been limited to those products obtained only by cold working, such as sheets, strip, wire and tubes. Extensive research revealed that the composition of Stainless W must adhere quite closely to the following analysis: 0.07 C, 0.50 Mn, 0.010 P, 0.010 S, 0.50 Si, 7.00 Ni, 17.00 Cr, 0.70 Ti, 0.20 Al, balance Fe.

The most important element was found to be titanium, which serves the dual purpose of being the primary precipitation-hardening element and a strong ferrite former. If the titanium content is dropped appreciably, the matrix remains partially austenitic after cooling to room temperature and only limited precipitation hardening will be obtained unless the material is cold strained or refrigerated. If the titanium content is too high, the hardening will be excessive and there will be a corresponding decrease in ductility unless a lower solution annealing temperature of a higher aging temperature is employed. It appears that the content of each element must be closely controlled to obtain desired characteristics.

FIG. 1—Stress-strain curves obtained at a constant temperature of 1800°F with increasing stress. Total time of test, 2589 hr; maximum creep rate, 2.36×10^{-6} in. per in. per hr. Ceramic material used contains about 84 pct beryllia.—National Advisory Committee.



Like a typical precipitation-hardening alloy, the material is heat treated in two operations. Solution annealing is accomplished by heating the alloy at a sufficiently high temperature to place the precipitation-hardening constituents into solid solution in austenite. Cooling to room temperature then transforms the austenite to ferrite, supersaturated with the precipitation-hardening constituents. Aging consists of reheating the alloy to a temperature where the precipitation-hardening constituents will precipitate out of the supersaturated ferrite and impart hardness and strength.

The strength of Stainless W at elevated temperatures (about 600° to 800°F) is about the same as that of annealed 18-8, while below this range the strength is equivalent to that of 18-8 cold worked to the full-hard condition. The corrosion resistance is equivalent to that of the 18-8 grades and the steel is weldable by any of the methods customarily used for stainless steels.

Since its inception, Stainless W has received an enthusiastic response. Its applications have been so extended that the alloy is being produced on a commercial production basis. Although many of the applications cannot be divulged at this time, it is no secret that the combination of hardness and corrosion resistance has done much to improve the quality of valves and pumps.

A new low-alloy, high-strength steel, still in the experimental stage, will soon be placed on the market by a prominent steel company. Containing less than 2 pct of any alloying element, the new steel possesses remarkable high tensile strength in addition to high impact. Some properties obtained from this material in the hardened and tempered at 450°F condition are: Tensile strength—240,000 psi; yield strength (0.2 pct offset)—195,000 psi; elongation (in 2 in.)—12.5 pct; and reduction of area—45 pct. The Izod impact strength is 31 ft-lb, tested at 70°F, and 29 ft-lb, tested at —100°F. Although the steel is still in the development stage, these properties have been duplicated with a commercial hea

Another stainless steel innovation is the production of 18-8 with carbon content limited to 0.03 max. In view of the low susceptibility to intergranular corrosion of this low carbon stainless, the elimination of titanium or columbium as stabilizing agents is possible. The 0.03 C stainless is made both as 18-8 unstabilized and 18-8 plus moly unstabilized (the molybdenum added for machinability).

Production of this steel is aided with the use of nickel oxide, which (1) has better solubility in molten steel than FeO and therefore promotes more rapid reduction in carbon content, and (2) the nickel resulting from the reduction of nickel oxide forms part of the nickel content of the stainless steel. It appears that the nickel can be added as part of the charge, or it can be introduced into the furnace at a later date, as long as it is added while the melter is still using a reducing slag.

Powder Metallurgy

The newest development in powder metallurgy is the development of precast powders. In Germany there is the Degussa process, which involved a great deal of research carried on in Germany by the Deutsche Pulver Metallurgia Gesellschaft, and in England by F. W. Berk. Development in this country parallels this insofar as brass is concerned, with the New Jersey Zinc Co. pioneering in this field. F. W. Berk (American Div.) spent several years in developing a liquid disintegrator which has since been applied to a large number of alloys, some of which have melting and casting temperatures above the ranges previously regarded as the limits for gas atomization.

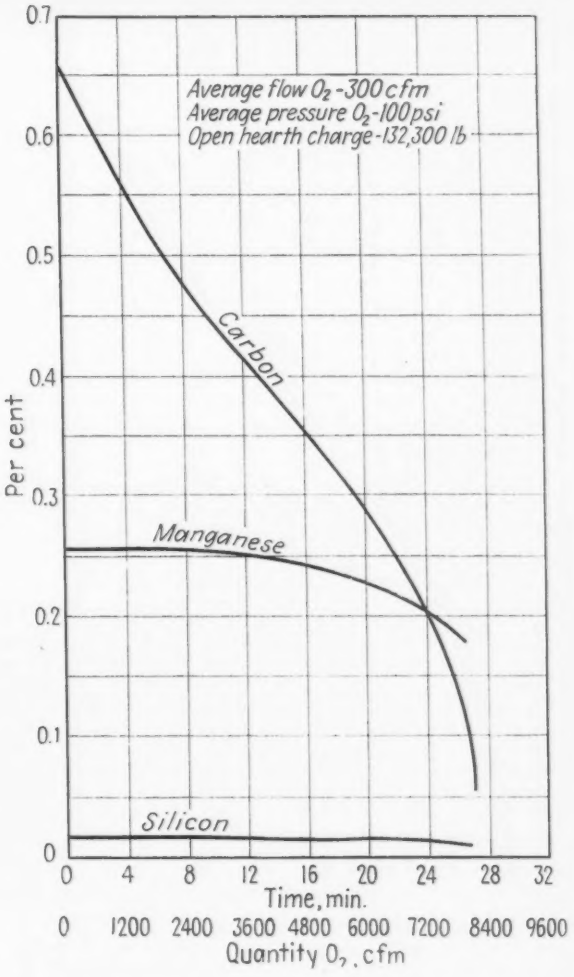


FIG. 3—Carbon and manganese production v. time and rate of oxygen in introduction into openhearth bath of molten steel. —Data courtesy Dominion Foundries and Steel Co., Hamilton, Ontario.

The use of alloy powders presents logical developments from primary metal powders (which must be alloyed during sintering) to the use of pre-alloyed powders which can be fabricated into parts by particle-to-particle fusion (adhesion) or by cementing with lower melting point primary or alloy powders. The limitations or advantages of precast powders have not yet been thoroughly explored, but it seems logical to assume that when they are available in commercial quantities they will be applied to bearings, friction materials, powder parts, contacts and even tool materials.

In Germany during the war, steel powder was made by three different methods in which all of the constituents of cast steel were present in fully alloyed condition. The methods employed in Germany were not particularly suitable for application in this country, but products have been made to suit the German economy. It appears that the developing American practice should be capable of meeting the requirements of this country and it seems as

though the next major improvement in powder metallurgy will be the use of pre-alloyed powders.

It appears that advances made in the metal powder industry have more to do with production of powders and the discovery of new applications for powders, than with any other phase. For example, iron powder produced by the reduction method, which has for some time been a leader of the field by virtue of its economic advantage, is being subjected to competition by the electrolysis and chemical methods. The electrolytic process recently described by the BU-EL Metals Co. has received a favorable reception both from the standpoint of producing powder with good characteristics and of producing it economically. In brief, the process involves the electrolysis of iron anodes (ingot iron) in an iron chloride base. The iron, which is deposited as a smooth electrolytic plate upon stainless steel cathodes, is readily stripped, dried and ground. The ground product is then annealed in order to soften the embrittled iron and to reduce any iron oxide present. Final regrinding is accomplished in a hammer-type pulverizer with the powder then mixed in a conical blender and packed for shipment.

Continental Machines, Inc., has reported a laboratory project, whereby iron powder is produced from iron carbonate slate by a chemical process. The iron is dissolved out of the ore with dilute sulfuric acid, precipitated as crystals of iron sulphate, and preferentially roasted to iron oxide. The oxide is then reduced to iron powder. Fifty tons of carbonate slate are said to be used daily in producing five tons iron powder. Since the program is still on a laboratory basis, it is difficult, as yet, to evaluate its economic potentialities. Moreover, iron powder production experts hesitate to express opinions, due to the lack of information regarding the technical aspects of the process.

Hot pressing, upon which the future of alloy powders is said to hinge, has not as yet been perfected to the point of being commercially successful, although a great deal of research along these lines is currently being conducted. It seems that the success of hot pressing is dependent upon the development of satisfactory die materials and lubricants. Some alloys, such as 18-8 stainless steel, are difficult to cold press due to work hardening—pressing at temperatures above the recrystallization point solves this problem.

The outlet for metal powders and alloys was recently expanded through the invention of a new flame process for welding, brazing and hardsurfacing with powdered metals. Demonstration of the application of stainless steel powder to iron and steel plates for corrosion resistance aroused wide interest at the recent Metal Congress Exposition. Sheets were bent more than 90 degrees with no cracking or separation of the stainless steel layer.

Charles Hardy, Inc., has announced that research work is nearing completion on the production of steel powders with carbon content to meet buyer's specifications. Success of such a venture would indicate that problems now confronting the industry in obtaining proper residual alloy contents have been largely overcome.

Vacuum Melting

It is sometimes desirable, in the course of metallurgical research or in small scale production of special products, to melt and cast metals and alloys in vacuum, or in an inert atmosphere. In this manner, certain gases or volatile impurities originally present in the melting stock can be eliminated.

The use of the vacuum arc has made possible, for the first time, the sucessful melting of molybdenum. In view of the high melting point of molybdenum (4757° ±90°F), the metal has been considered too refractory to be melted in commercial quantities. Manipulation of liquid metals at temperatures above about 3630°F presents some difficult problems in heat transfer, in purification and in container materials. Powder metallurgy methods, which have been in use to date, present the disadvantages of relatively high cost and size limitations of product.

A schematic sketch of a method developed, fig. 4, illustrates the melting, deoxidizing and casting procedure. The apparatus consists of parts as designated by the following numbers; (1) vacuum case, (2) piston drive, (3) powder supply and feed, (4) nozzle, (5) opening to vacuum pumps, (6) sintering zone, (7) contact, (8) water-cooled copper mold, (9) arc, (10) cast metal and (11) electrical connections.

Although present capacity of the apparatus described is the making of a molybdenum casting weighing about 25 lb, there is no reason to believe that larger castings cannot be made by this process. The commercial grades of molybdenum are deoxidized with carbon in the melting process in order that the cast metal may be forged. Now that tungsten and molybdenum alloys can be melted and cast, it will be interesting to see what further developments are made, in view of the widespread interest in refractory metals for high temperature service.

The subject of vacuum melting is, of course, not new. In German production sized high-frequency furnaces (capacity of largest furnace in 1938 was 11,025 lb) have been in operation since 1931. A large number of alloys have been produced by this method, including copper-beryllium, nickel-chromium, nickel-iron, iron-chromium-aluminum, copper-beryllium, and many others.

An interesting application of vacuum melting was reported by R. M. Parke and F. P. Bens, Climax Molybdenum Co. of Michigan, in their development work on chromium-base alloys for high temperature service. Since brittleness has been one of the characteristics hindering the use of chromium-base alloys, vacuum melting was utilized in order that the alloys be free (as far as possible) from elements such as carbon, oxygen and nitrogen, which increase the inherent brittleness. Not only was the removal of these undesirable elements successful, but the loss of chromium by vaporization—molten chromium has relatively high vapor pressure—was held to less than 2 pct.

Coincidental with high-vacuum research carried out during the war with respect to preparation of magnesium, lithium and other members of the alkali and alkali earth group, National Research Corp. has been interested in the preparation of gas-free metals by vacuum melting and vaporization. Emphasis has been placed on the effect and removal of gaseous impurities in metals. Copper has been of great interest to date, a research program having brought forth a gas-free metal of high purity now available on an experimental scale under the name "GF" copper. Tests and chemical analyses have shown this product to have higher density, electrical and thermal conductivity, and superior ductility without sgnificant

loss of hot or cold strength, these advantages being the result of removal of gases and other impurities. Also, a variety of gas-free metals and alloys have recently been produced to meet the demands of the metal industry for new products. This program includes new developments in vacuum techniques for preparation, purification, and degassing metals and alloys. At present a number of research problems are being investigated to determine the applicability of high-vacuum process in their solutions. Among the great number of metals and alloys of interest, high-temperature alloys, magnetic alloys, and corrosion-resistant alloys show promise. Work is also in progress to demonstrate the advantages of high vacuum in the fields of heat treating, and sintering. Much of the effort in these latter fields involves vacuum engineering problems of high temperature furnace design.

*"You guys 'll have to move faster than that to keep this scrap eatin', *-+&$'!' oxygen burnin' furnace happy."*

Hardenability

A great deal of controversial matter has been published discussing the pros and cons of the end-quench specimen and its suitability in determining hardenability of deep hardening steels. The usefulness of the method has been extended to include cast steels, and experimental data have been published verifying the fact that both forged and cast steels respond identically to the end-quench test.

The influence of the test is growing in the field of metallurgy, and it has been said that in the future a very large percentage—if not all alloy steel—will be ordered on a hardenability basis. The end-quench hardenability test has been well standardized to date, and where the exact procedure as described by SAE is followed, results will check quite closely. In a given laboratory results are said to be duplicated within two or three points Rockwell C. However, when tests of the same bar of steel are sent to other laboratories, the results may vary as much as ten points Rockwell C, as a result of deviation from recommended test conditions. A recent investigation conducted by SAE indicated that there is a difference of about four points Rockwell C in the hardness testers in various laboratories.

The opinion has been expressed that more study is required to extend the usefulness of the end-quench test to the final products, which are in the great majority of industrial applications, not in the as-quenched, but in the quenched and tempered condition. Also, the end-quench test must be more carefully analyzed to determine its limitations in accuracy as imposed by practical variations in the uniformity of material in a given heat, and in the processing operations during heat treatment.

G. K. Manning found that it was not possible to predict accurately the hardness of a round from a knowledge of end-quenched hardenability data and cooling rates. The discrepancy between actual and predicted hardness tended to increase with the diameter of the round. It may be possible to make an arbitrary correlation between the end-quench hardenability and the hardness of a certain part based on actual hardness tests, but even this correlation would be expected to become unreliable if the steel composition is decidedly changed. Stresses caused by allotropic transformation and thermal gradients during quenching are regarded as the probable reason for the failure to obtain a good correlation between predicted hardness based on equal cooling rates and actual hardness.

No standardized procedure for determining hardenability of shallow and medium hardening steels has been established as yet. In addition to the various tests already on record, including the cone type, L-type, modified L-type, Rockwell inch, and McMullan wedge test, B. F. Shepherd has developed the P-V test. This latter method has two desirable characteristics, in that it spreads out the cooling rate curve and has a high degree of reproducibility among different laboratories.

In spite of these and other favorable features of the P-V test, such as ease of specimen preparation and accuracy in making readings, it appears that the modified L-type test rates in the opinion of many experts and students of hardenability. The difficulty in machining operations and the danger of cracking of the modified L-type specimen seem to be outweighed by the advantages of uniform hardness from side to side of the specimen, wide range of hardenability values, cooling rate spread and elimination of steam pockets which caused trouble in the L-type specimen.

Die Castings

The die casting industry has reported a strong comeback in 1946, following the lean years of 1942,

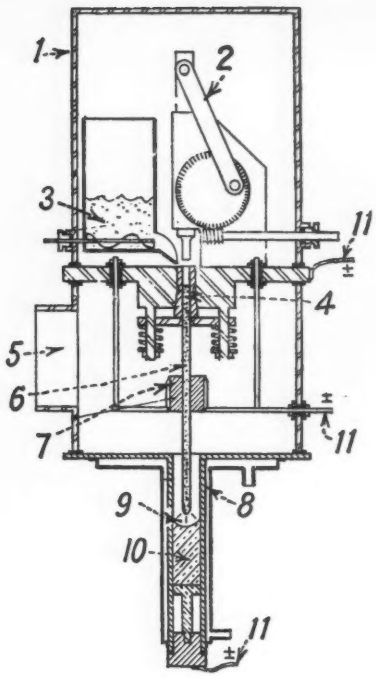


FIG. 4—Apparatus for vacuum arc melting and casting of moylbdenum.

'43 and '44, during which time production dropped to about one-half of the 1941 level. Zinc-base die castings, in particular, have almost reached the 1941 high during the past year. The magnesium alloys have experienced a similar trend, while aluminum, for which many new applications have been found, has also shown a marked increase in production.

With respect to the aluminum alloys, Alcoa alloy 360, which contains 0.6 Cu max, 9.0-10.0 Si, 1.3 Fe max, 0.4-0.6 Mg max, 0.3 Mn max, 0.5 Zn max, 0.5 Ni max, and 0.1 Sn max, has replaced in popularity the Alcoa 13 alloy which is similar to 360 alloy, except that it contains 11 to 13 pct Si and 0.1 Mg. Higher physical properties with no decrease in castability and corrosion resistance has lead the 360 alloy to generally replace the type 13.

No marked changes in die casting equipment have been made during the past year other than slight design changes leading to improved performance. The trend to larger machines and dies has, of course, inherited problems, particularly with production of larger sized dies.

Production of higher melting alloys, such as brass, will definitely have limited possibilities until a satisfactory die material can be found. Extensive tests have been conducted with the high chromium (12 to 30 pct Cr) and chromium-nickel stainless and heat-resisting steels, the high-speed tool steels (and many variations in composition) and a large variety of new alloy compositions with high contents of chromium, molybdenum, tungsten, cobalt and others. Cemented carbides have also been tried, and although they give better performance than do other materials, the costs are prohibitive. Consequently, the same type of hot-work steel (0.30-0.40 C, 9.00-15.00 W, 2.75-3.25 Cr, 0.25-1.50 V, 0.20-0.50 Si, 0.20-0.50 Mn, 0.02 S max, 0.02 P max) is currently being used for brass die casting dies as was used at the outset.

Nonferrous Developments

The past 2 yr have seen several notable advancements made in the development of high strength aluminum alloy products and in extending manufacturing techniques. For example alloy 75S, the present ultimate in high strength aluminum alloys was originally available only for extruded shapes and as alclad sheet and plate. Techniques have been developed to produce this alloy in the form of drawn tubing and as bare sheet and plate. Another alloy, 14S, has been introduced for extruded shapes and also in the form of alclad sheet and plate.

A new alloy, which has been on the market for about a year, is 63S. Developed primarily as an extrusion material, alloy 63S has especially high resistance to corrosion, and will take a clean, bright anodic finish with a minimum of streaking and discoloration. Its principal uses are for architectural applications and irrigation pipe.

Another new development is Alclad 3S pipe, which has the outstanding characteristic of high resistance to perforation by corrosion. Now available in the form of pipe, with the Alclad coating on the inside only, Alclad 3S is finding wide acceptance for numerous applications in the chemical processing industries.

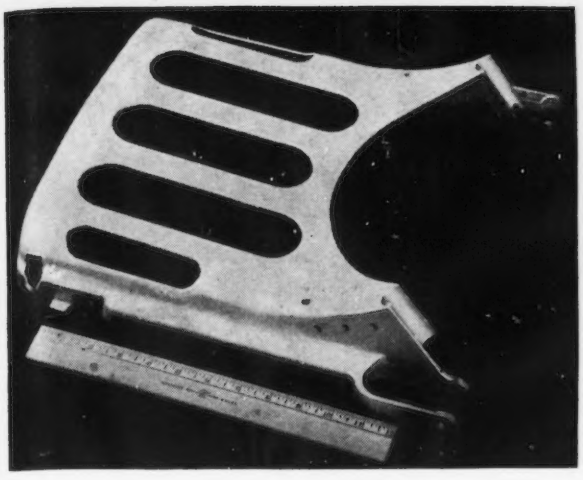
Aluminum bearing alloys are also relatively new, although tests were started along these lines about 1936. Alloy 750, which contains about 6.5 Sn, 1.0 Ni, 1.0 Cu, balance Al, is a permanent mold casting that has been on the market. A modification of this composition, which retains the physical characteristics and adds improvement in frictional and anti-seize properties, is alloy XA750, which contains about 6.5 Sn, 2.5 Si, 1.0 Cu, 0.5 Ni, balance Al. These two alloys plus alloy XA8OS (a wrought alloy) and another new alloy now undergoing test, are finding increasing use in high-duty engines as connecting rod, main and thrust bearings.

Considerable progress has also been made in the development of alloys that employ secondary aluminum. One such alloy is used to make corrugated roofing sheet for farm roofing and siding. Another goes into the production of cast piano plates for Spinet type pianos. The development of alloys that employs varying quantities of scrap metal permits greater expansion of markets by virtue of having a lower cost material available to meet certain specifications and conditions.

An interesting advance has to do with the improved melting and refining practice developed by Reynolds Metals Co. for reclaiming aluminum from wrecked and obsolete aircraft. It is claimed that the ingot metal obtained from these operations has been of such high quality as to duplicate the chemical analyses of the 17S or 24S aluminum from which the aircraft structures were originally made.

An unusual feature of this process is that the scrap can be melted down without cutting—in fact wings and fuselages, which are about 30 ft long, can be handled as such. The scrap is handled mechanically, and piled on the charging floor, which is level with the top of the sloping hearth of the melting furnace. When sufficient scrap has accumulated, the furnace door is lifted and the scrap charge is pushed into the furnace.

The aluminum melts and runs down the sloping hearth, leaving any iron, steel, copper and other parts on the hearth to be raked off. To prevent oxidation (burning) of the aluminum, the two oil burners fire with a reducing flame. Chlorine gas is introduced into the bath of molten metal to flux out magnesium and other impurities. Since the use of chlorine gas is hazardous, precautionary measures



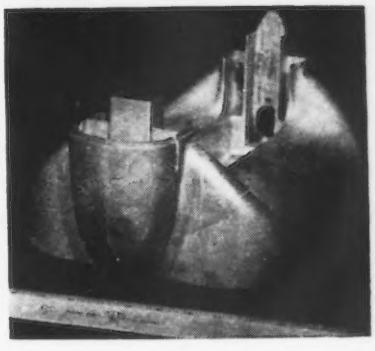


FIG. 5 — (Left) — Back support of baby stroller — one of nine die cast magnesium (R alloy) parts from which stroller is made. (Right) — Washing machine drainboard and wringer mounting produced from a single aluminum die casting (alloy 13). — Photos courtesy Doehler Jarvis Corp., New York.

must be observed. To date, no difficulties have been reported encountered from the chlorine. No desirable alloys are lost during the reclamation process, and the pickup in lead and zinc is slight. Magnesium is said to be held to a maximum content of 0.25 pct.

An outstanding new aluminum product is rubber-covered aluminum building wire for both industrial and domestic buildings. Although aluminum has been used as an electrical conductor for half a century, being employed extensively for steel-reinforced cable and industrial bus conductors, this is the first time aluminum building wire has been marketed commercially in the United States (effective Sept. 1, 1946, aluminum building wire was approved by the Underwriters' Laboratories Label Service).

The Poland furnace for the recovery of zinc in the secondary metals, particularly brass, seems to be promising, and is said to be in commercial use. This is an internally-heated electric furnace having a temperature up to approximately 3200°F, and is equipped with a condenser whereby a volatile metal can be quickly removed from those of lower vapor pressure.

The Bureau of Mines has been doing some interesting work on the recovery of cobalt, manganese, and chromium, from ores. Their work on the production of ductile titanium and zirconium has been noteworthy, and suggests a trend in nonferrous metallurgy which probably will be of considerable importance. Among miscellaneous alloy developments, an interesting cobalt-base alloy has been made for use as a tape recorder of sound.

Inspection and Testing

Many improvements have been made in apparatus and techniques, arising from the emphasis that was placed on inspection and testing during the war years. Nondestructive testing techniques received particular consideration, primarily to reduce the percentage of rejections and number of service failures.

The scope of X-ray inspection was greatly expanded by the development of the 1 million and 2 million volt units. The advantages in improved sensitivity and increase in speed of testing had hardly been realized, however, when Allis-Chalmers announced a 20-million betatron X-ray unit, which further accentuated these advantages.

The betatron makes possible the radiography of thick section steel, bronze, and other heavy metals. Plotting (1) an absorption curve for steel and (2) the theoretical intensity distribution spectrum of X rays produced by the betatron, on one chart, indicates that most of the X rays produced are in the region of low absorption of steel (the absorption curves for other heavy metals are similar). In other words, the X rays in the approximate range of from 3 to 20 million electron volts are the most penetrating, and the absorption curve is nearly constant over this range, which is the region of most of the X rays produced by the betatron.

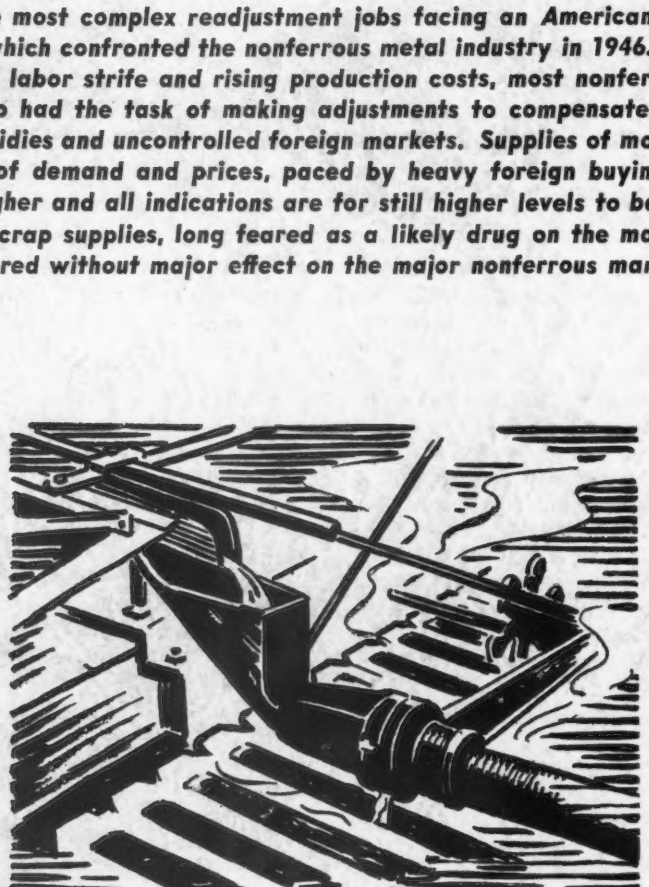
It is claimed that with this improved method for detecting minute flaws inside heavy sections, the heavy equipment field will be able to cut down on "overdesign"—that is, the substantial safety factor now being utilized can be reduced along the lines that the automotive and aircraft fields have followed.

No startling improvements have been reported the past year with respect to the application of the electron microscope to metallography. In an educational lecture at the Metal Congress, Dr. C. S. Barrett expressed the opinion that on the whole, results are quite disappointing and that techniques have not yet been perfected to the point of permitting drawing definite conclusions from electron microscope pictures. The complexity of the apparatus plus inherent difficulties in making an actual micrograph has held down the number of instruments in use and has restricted the instrument for laboratory research purposes.

One of the primary drawbacks to success of electron microscope technique, according to Dr. Barrett, is that present etching methods are not adequate. To date, electropolishing seems to be the favored method for specimen preparation. Difficulties in producing satisfactory replicas also continue to hamper efforts of metallurgists in utilizing the electron microscope.

NONFERROUS METALS

One of the most complex readjustment jobs facing an American industry was that which confronted the nonferrous metal industry in 1946. Harried by general labor strife and rising production costs, most nonferrous producers also had the task of making adjustments to compensate for cancelled subsidies and uncontrolled foreign markets. Supplies of most metals ran short of demand and prices, paced by heavy foreign buying, moved sharply higher and all indications are for still higher levels to be reached in 1947. Scrap supplies, long feared as a likely drug on the market, disappeared without major effect on the major nonferrous markets.



By JOHN ANTHONY
Eastern Regional Editor
THE IRON AGE

THE world demand for nonferrous metals grew to unprecedented peacetime tonnages during 1946 for civilian production here and abroad, and for foreign reconstruction. But domestic production of copper, lead and zinc faltered badly from long drawn out wage disputes at mines, refineries, smelters and fabricating plants.

The world shortage of nonferrous metals production in the face of unprecedented demand, coupled with inflationary trends here and abroad, served to bid up world prices of all the nonferrous metals much higher than prewar levels. OPA struggled valiantly, aided by Reconstruction Finance Corp. funds to subsidize imports and marginal domestic production, to hold down domestic metals prices to wartime levels.

All went well, with moderate midyear increases to compensate for approved wage increases in prices of brass, bronze, copper and lead products, ingots and scrap, when the lapse of OPA authority during July served to create maladjustments throughout the industry. Primary producers of copper maintained the OPA price structure but producers of lead and zinc increased their prices by the amounts to have been received from premium payments, which were ended with the OPA. Scrap dealers and ingot producers of copper alloys, lead and zinc raised prices correspondingly.

With enactment of the OPA Extension Bill effective July 26, the agency rolled back prices of primary and secondary metals and scrap to previous ceilings, except for cadmium and bismuth which were decontrolled. Custom smelters and scrap dealers were thereafter reluctant to release metal for sale at ceilings which had been bought at the higher free market prices. The roll-back was opposed by CPA which recognized its serious impact on the flow of the limited supplies of copper, lead and zinc to consumers. Government, itself, was forced to recognize the over-ceiling free market operating during lapse of OPA controls when the Office of Metals Reserve, buying agency for RFC, authorized sales of lead at market prices.

Under the increasing pressure of world demand, it can be predicted that most of these metals must reach higher prices before leveling off and declining to more normal peacetime levels.

Shortly after price decontrol and the rise of domestic metals prices to world levels, CPA ordered RFC to discontinue the importation of foreign lead, antimony and copper except on commitments already made. With this action the responsibility for supplementing domestic supplies of these metals with imported metals and concentrates was returned to private enterprise. However, import duties, waived during the wartime period of government-subsidized imports, became collectible again.

Lead has been in the most critical supply position of any of the nonferrous metals since the end of the war. In view of this, purchases of the United Kingdom and the United States have been coordinated under an informal arrangement since 1944 and the metal had been allocated on an international basis. This arrangement was terminated with the ending of government imports. Unlike the situation in copper, RFC had made no contracts for the first quarter delivery of foreign lead. The current price of lead, 12.55¢ at New York, exceeds that of zinc for the first time in history.

The government stockpile of lead, 68,700 tons at the beginning of the year, continued below that figure throughout the year and was supplemented for the purpose of CPA allocations by requiring domestic producers to set aside 25 pct of monthly production beginning in August. The government established the minimum at 38,000 tons below which the stockpile would not be permitted to drop. During July and August, however, it was not possible to maintain even the minimum tonnage.

The domestic production of copper, lead, zinc and cadmium was seriously reduced during 1946 as the result of extended labor difficulties during the first half of the year at mines, smelters, refineries and fabricating plants. Output of copper mines and smelters dropped about 50 pct from February through June; refineries, 65 pct; brass mills, 12 pct; and copper wire mills, 5 pct.

Copper mine production was close to 600,000 short tons as compared with 772,894 tons in 1945. The Bingham Canyon, Utah, mine of the Utah Copper Co., the world's largest, was out of production for 5 months. Labor difficulties on a comparable scale affected other mines, smelters, refineries and rolling mills.

Imports of copper into the United States were also reduced by labor difficulties abroad, particularly in Chile, the principal source of supply. Labor difficulties in Rhodesian copper mines encouraged the United Kingdom to engage in competitive buying in Chile and served to force up the world price. The UK also received the Belgian Congo copper and a large part of Canadian production, much of which came to the United States during the war. Imports of unmanufactured copper into the U. S. were 400,000 tons in 1946 as compared with 853,196 tons in 1945. Imports of refined copper during 1946 approached 150,000 tons.

Consumption of copper decreased sharply in comparison with the war years as a result of the lighter gages of metal in production by fabricating mills as compared with such heavy gage applications as shell cases and rotating shell bands. The consumption of 1,000,000 tons of copper during 1946, very high for a peacetime year, compares with 1,542,403 tons in 1945.

Lead production and imports were seriously reduced during 1946 by a strike lasting from February through June in 18 domestic mines, smelters and refineries of the American Smelting & Refining Co. and a 6-week mine strike in Mexico, from which most U. S. imports come. These, and intermittent labor disturbances at

THE only magnesium ingot producer at present in operation is the Dow Chemical Co. plant at Freeport, Tex. Circular vats at left are Dorr tanks in which seawater is reacted with slaked lime to precipitate magnesium hydrate. Center buildings contain cells where metallic magnesium is extracted from magnesium chloride.

mines and plants of other major producers, seriously handicapped production during the first half of the year, and to a lesser degree during the remainder of the year. Mines not directly affected by strikes were in many cases forced to shut down because the smelter strikes made it impossible to dispose of their concentrates. Domestic mine production of recoverable lead was 330,000 short tons in 1946, as compared with 390,835 in 1945.

The lead crisis was worldwide. Western Europe, with heavy reconstruction needs, was unable to draw on its normal prewar sources in the mines of Silesia and Yugoslavia, whose entire output now goes to Russia. This demand was diverted to mines in the Western Hemisphere and Australia. Mines in Burma, out of production during the war, did not resume production.

Pig lead imports during 1946 totaled 140,000 tons, as compared with 230,313 tons in 1945, most of it from Mexico but with substantial tonnages coming from Canada and Peru. Australian lead, contributing to U. S. requirements during the war, went to Great Britain in 1946. Secondary recovery of lead from scrap was about 320,000 tons, most of it from battery plates. This figure compares with 1945 secondary recovery of 363,039 tons.

Disturbed labor and market conditions restricted the mining and smelting of zinc during 1946 with some consequent disruption of zinc consuming industries. Despite mine and smelter labor difficulties during the year, domestic mines produced ore containing approximately 560,000 tons of zinc, compared with 614,344 tons in 1945.

Total domestic production of primary slab zinc was about 750,000 tons from foreign and domestic ores. Redistilled secondary slab zinc production totaled approximately 38,000 tons; about 14,100 from primary smelters and 24,000 tons from secondary plants.

Unlike the situation in copper and lead, the government discontinued subsidized imports of foreign zinc at the end of 1945 and authorized private imports at that time. Total imports in 1946 consisted of approximately 240,000 tons of zinc in ore, as compared with 290,965 tons in 1945, shipped to United States smelters largely from Mexico, Canada, Bolivia and Argentina; and about 100,000 tons of slab zinc, compared with 70,922 tons in 1945, about three quarters of it from Canada.

Galvanizing was once more the principal use of slab zinc, followed by zinc base alloys. Brass mill products, for which most zinc was used during wartime, were in third place. During the largest part of the year stocks available to consumers were badly out of balance, although overall zinc stocks were ample. Prime Western zinc, used by galvanizers, and Special High Grade, used for die castings, were in serious short supply all year. This condition was created largely by the OPA schedule which provided a differential between Prime Western and Brass Special and fostered upgrading by producers, and the lack of a differential between High Grade and Special High Grade which encouraged consumers to demand the high purity zinc. Shortly after price decontrol several producers established a price differential of ¼¢ between High Grade and Special High Grade in order to reduce consumption and encourage additional production of this grade.

In the production of copper, lead and zinc, RFC continued to subsidize over-quota production by high cost mines under the Premium Price Plan. The plan, tied to OPA legislation, was inoperative during July. Uncertainty as to the payment of premiums caused a reduction of the production by many of the smaller mines whose future was uncertain. The plan was adjusted during the year to compensate mines and smelters for authorized wage adjustments following the wave of strikes in the early part of the year, and to provide for additional exploration work. In the most recent report on the operation of the program to the

end of 1945 from its inception in February 1942 the following premium production resulted from the indicated payments.

	Short Tons	Premium Payments	Average Over-Ceiling Cost, a lb
Copper*	723,816	$82,993,110	5.7¢
Zinc	1,450,544	121,331,598	4.0¢
Lead	675,069	45,831,092	3.3¢
Total		$250,155,800	

* Copper figures to June 1945 only.

It is significant that during the life of the subsidy program the percentage of ceiling production to total mine production decreased appreciably each year for the three metals. In 1945, only 38 pct of lead production and 34 pct of zinc production was not subsidized as compared to 83 pct and 71 pct in 1942.

Cadmium is a byproduct of zinc and lead smelting and therefore its supply is contingent on the rate of production of those metals. There are no known workable deposits of cadmium ores as such. Some cadmium is obtained from Mexico and Canada in the form of flue dust from zinc and lead smelting operations. Refined in the United States, this source constitutes nearly 20 pct of the domestic supply.

Prewar use of cadmium was approximately 300,000 short tons per yr but aircraft industry uses built up consumption to a peak of 443,000 tons in 1944. It is estimated that yearly consumption will be at the rate of 400,000 tons per yr while production will provide only 350,000 tons.

China has always provided the bulk of the world's supply of antimony although the largest supply for domestic needs has come to the United States in the form of ore from Mexico and Bolivia. Imports during 1946 have dropped considerably due to the depletion of government stocks of Bolivian ore purchased in 1943 and stored in Chile until 1945, coupled with strong competition on a price basis from other countries for available foreign ores. Meanwhile, China's civil war and inflated economy prevents the shipment of significant tonnages.

Recovery from scrap, principally old battery plates, has been the most important domestic source of antimony, producing 16,000 to 17,000 tons a yr. Until the Yellow Pine Mine in Idaho came into production, domestic mine production was negligible. It is probable that domestic mine production may account for about 13 pct of available tonnage in 1946.

Tin production in the Far East, the area formerly producing 70 pct of the total world supply, was disappointingly small during 1946. World supply was therefore far short of peacetime consumer demand and was rationed in all consuming countries.

It is estimated that Far Eastern production will have amounted to between 24,000 and 30,000 long tons in 1946, compared with an annual prewar production average of 160,000 tons. This poor showing is the result of the condition of the mines and native labor following the Japanese retreat, lack of dredges and other equipment, political unrest and inadequate food supplies.

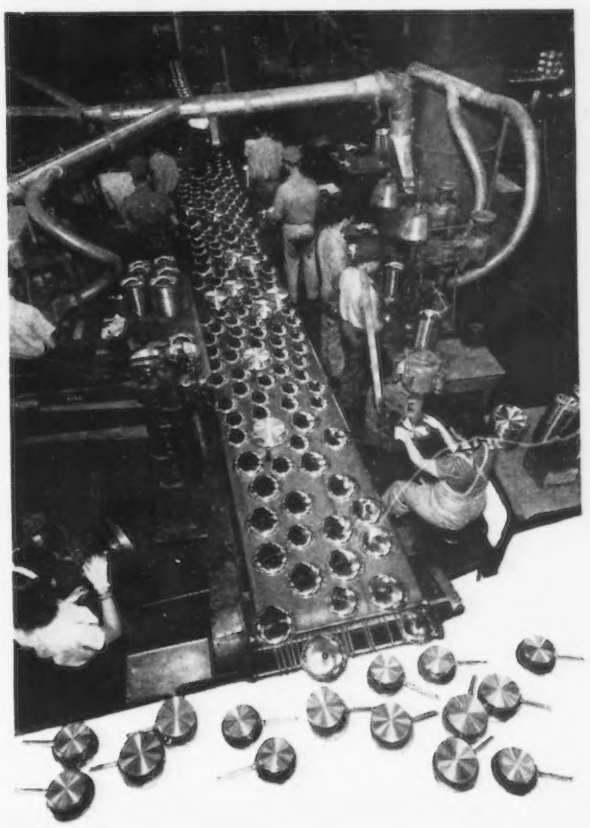
Tin stocks in the form of pig tin, concentrates and solder recovered from the Japanese were about 41,000 tons. It is estimated that 1947 tin production from the Far East will be only 50 pct of the prewar rate and full output may not be reached until 1948 or 1949. Total world production during 1946 was only slightly higher than the 87,000 long tons total for the previous year.

Secondary tin recovery from scrap by detinners and others provided United States consumers with 2600 tons of tin as metal and 29,000 tons of tin content in the form of alloys and chemicals.

World consumption of new tin during 1946 was at the rate of approximately 115,000 tons annually. The difference between Far Eastern production and this consumption rate was made up by production from other areas and by continued withdrawals from prewar stocks. Allocations of world tin production were made to consuming nations by the Combined Tin Committee which took over the worldwide tin allocating function of the Combined Raw Materials Board when it was disbanded at the end of 1945. Seated in Washington, representatives of Belgium, France, the Netherlands, the United Kingdom and the United States determine how the available tin shall be distributed among claimant nations.

The tin cartel, the International Tin Committee, during the war has had virtually no reason for existence in view of the restricted supply-demand relationship which may be expected to last for several years. The function of this committee is to control production and exports in favor of a stabilized market for tin. It is understood that at a meeting of committee members called for the purpose, it was decided to recommend the continuance of the cartel beyond the end of 1946 when

PEACETIME aluminum needs have required the full production of all operating ingot and fabricating plants and the order backlog for sheets and extrusions continues to grow. One of the lines of Reynolds Metals Co.'s plant No. 14, shown here, produces more than 55,000 cooking utensils daily.



otherwise it would have expired. No public announcement of the recommendation has yet been made.

For the first 9 months, imports into the U. S. were 32,000 tons of tin in ore and concentrates, to be refined at the government-owned Longhorn smelter at Texas City, Tex., and 10,000 tons as metal. The greater portion of the ore and concentrates came from Bolivia, with a smaller amount of higher grade concentrates from the Belgian Congo and Netherlands East Indies. The United Kingdom drew tin supplies from Bolivia, Nigeria and the Belgian Congo.

It is estimated that Britain and the United States in late 1946 held between them stocks in excess of 100,000 tons, of which 60,000 tons were in pig tin and 40,000 tons tin content in ores and concentrates.

The government's Longhorn smelter is expected to be continued in operation at least for several years because of the world shortage of tin regardless of considerations of national defense which might later enter into the picture. At the end of 1945 the smelter was operating at a 44,000 ton annual rate. To continue at this rate requires consistent receipts of high grade concentrates which are used to sweeten the lower grade Bolivian concentrates. These high grade concentrates constitute only 10 to 15 pct of the charge. Government tin operations were subsidized in 1945 to the extent of $12 million.

Fantastic figures of ultimate world tin consumption have been foreseen by some factors in the industry. Probably the highest is that of 250,000 tons forecast by the Tin Producers' Assn. The increasing share of electrolytic lines in tinplate production is sure to bring down tin consumption for this product, the biggest consuming application. The output of electrolytic tinplate in 1945 is reported to be 873,000 short tons, an increase of one third over 1944. This production figure is equivalent to one third of total domestic tinplate production. Moreover, world consumption of tin averaged about 100,000 tons per yr during the war without any significant hardships having been imposed on the ultimate consumer. From these factors it would seem that world tin consumption might well be expected to level off at 125,000 to 150,000 tons for the next few years after production is fully reestablished.

Primary aluminum production in the United States in 1946 approximated 1945's 1 billion lb but fell short of 1944 production of 1,552,892,000 lb. Unprecedentedly heavy demand from industry and agriculture offset reduced military demand of the preceding war year.

The industry's wartime peak capacity of 2,350,609,000 lb dropped nearly 50 pct to about 1,229,066,000 in 1946. Several government plants were sold or leased to private operators with the result that the 1946 primary metal capacity was almost four times the prewar capacity of 325,000,000 lb annually.

Lease by the government of the Hurricane Creek, Ark. alumina plant and the Jones Mills, Ark. aluminum reduction plant to Reynolds Metals Co. was followed early in 1946 by lease arrangements to private companies of nearly all the other government-owned plants for which peacetime production is economically feasible. These include the Phoenix, Ariz. extrusion plant to Reynolds; the McCook, Ill. (Chicago) sheet mill to Reynolds; the Baton Rouge alumina plant and the Spokane, Wash. (Trentwood) sheet mill to Henry J. Kaiser interests; the Spokane (Meade) reduction plant to the Kaiser interests; the Troutdale, Ore. reduction plant to Reynolds; and several smaller plants. The dismantled Cressona, Pa. extrusion plant was sold to the Aluminum Co. of America; and the Tacoma, Wash. reduction plant to the Kaiser interests.

Alcoa, ruled a monopoly in aluminum ingot production in violation of the Sherman Act in 1940 had only 52.4 pct of national capacity by the end of 1946. Reynolds Metals, primarily a producer and fabricator of finished products prior to the war, in 1946 owned or controlled 30.1 pct and Kaiser, a newcomer to the aluminum business, 17.4 pct.

Although ample facilities appeared to exist for producing aluminum, further expansion of mills to roll it into finished form is in prospect. Alcoa has announced plans to build a new mill at Davenport, Iowa, with an annual capacity of 120 million lb of sheets and plates. This mill will be able to roll aluminum plate in sizes to provide for marine shipbuilding needs.

Demand for many finished aluminum products such as sheets and extrusions was so great during 1946 that delivery lagged by 20 weeks to a year. Difficulties involved in returning to production some of the metal producing plants and rolling mills leased from the government kept them below capacity operation for most of the year.

Use of secondary aluminum kept pace with increased demand for the new metal. Reserves of wartime scrap from contract terminations and wrecked aircraft which appeared mountainous at the beginning of the year had all but disappeared by the year end. Market prices of scrap climbed and at the end of the year secondary ingot was selling for higher prices than virgin ingot. Total secondary ingot production for the year was approximately 264 million lb.

Only one magnesium producer of 9000 short tons annual capacity was operating at the year end, compared to the peak wartime capacity, never fully utilized, of 293,000 tons from 16 plants. This plant is the Freeport, Tex. unit of Dow Chemical Co. which recovers metal from sea water. The plant was operating at maximum capacity at the end of the year. The only prewar magnesium producing unit, the Dow Chemical Co. plant at Midland, Mich., was dismantled. This plant had used salt brine wells as its source of raw material.

The large privately held stocks owned by Dow Chemical Co. had been largely consumed when the Freeport plant was reopened in July. Preparations were being made by the Henry J. Kaiser interests to reopen the Permanente Metals plant near Los Altos, Calif.

Shipments of wrought magnesium products totaled 3100 tons during the year, slightly over 1945's 3000 tons. Plates, sheet and strip represented slightly more than half the tonnage, the balance being extrusions and forging stock. Shipments increased rapidly during the year and the tonnage of the closing months was nearly double the earlier months.

Casting production which was almost wiped out at the end of the war was slowly built up to a monthly rate of 500 tons at the close of the year. Of this tonnage, 85 pct was sand castings; 9 pct die castings, and 6 pct permanent mold castings. Rapid increases in wrought and cast magnesium production for peacetime applications reflect the aggressive development and promotional activities of the industry.

Ingot production plants to be held in a standby condition for defense needs have a total capacity of 88,000 tons. The Velasco, Tex. electrolytic plant has a capacity of 36,000 tons; the Spokane, Wash. ferrosilicon plant, 24,000 tons; the Painesville, Ohio electrolytic plant, 18,000 tons; the Luckey, Ohio ferro-

ONE of the largest commercial grade tungsten properties in the country is located at Townsville, Vance County, N. C. Operated by the Tungsten Mining Corp., and owned jointly by General Electric Co. and Haile Mines, Inc., the ore assays from 0.7 to 2.0 pct WO_3 with average mill feed at 1.0 pct. The 200 ton per day gravity concentrator shown produces 2500 to 3000 units of WO_3 per month of 60 pct or better concentrate.

silicon plant, 5000 tons; the Canaan, Conn. ferrosilicon plant, 5000 tons.

With requirements for ferroalloys for steelmaking far below wartime levels, mining of such ferroalloy minerals as occur in the United States dropped sharply, and imports were decreased correspondingly. Metals such as chromium and manganese, for which tremendous efforts had been made to develop domestic resources during the war, returned almost completely to the cheaper foreign sources of supply.

Molybdenum was mined domestically in far smaller tonnages than during the war. Mine production in the U. S. was about 13.2 million lb in 1946 as compared with 1945's 30.8 million lb. Molybdenite comes from three mines in the United States of which the Climax Mine in Colorado is the largest and accounts for about half total production. The balance of molybdenum production is a byproduct of the mining of copper and tungsten in Utah, New Mexico, Arizona, Nevada and California.

As an alloying agent in steel, the use of molybdenum which reached a peak during the war as a substitute for scarcer alloys such as tungsten and nickel, has increased tremendously over prewar levels and is now added in small amounts to more than three quarters of the alloy steels. It is particularly important in the special heat and corrosion resistant alloys which were developed during the war. Its high melting point, 4748°F, fosters use in small amounts for crucibles, electronic tube parts, thermocouple tubes and furnace heating elements operating in a vacuum or protective atmosphere. A stockpile of molybdenum concentrates totaling 4.5 million lb contained molybdenum is held by the government.

Developments of deposits in Cuba and Russia have recently cut the nickel production of the Sudbury, Ont., district of Canada from 90 to 75 pct of total world production. It is estimated that 1946 Canadian production totaled about 200 million lb compared with 1945's 246 million lb.

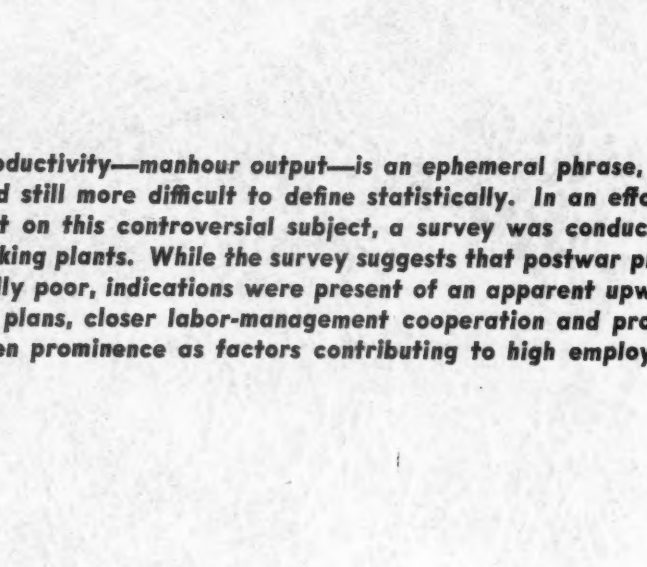
The former Finnish nickel deposits at Petsamo bought by Russia from the Mond Nickel Co. Ltd., a subsidiary of the International Nickel Co. of Canada, Ltd., for $20 million, is now under development by Russia. New Caledonia mine production is now going to France. Cuban nickel deposits from which nickel oxide is produced, developed under the sponsorship of the government during the war, was operated during the year by the Nicaro Nickel Co., a subsidiary of Freeport Sulphur Co. The government has indicated that when the contract with the Cuban producer expires at the end of 1946 the plant would be subject to disposal.

Increasing demand for stainless steel and heat and corrosion resistant steels, in which nickel is a principal alloying agent, indicates that demand for nickel may be expected to continue above prewar rates. The continuing use of the triple-alloy steels developed during the war in relatively large tonnages should also foster nickel consumption.

Held for 20 yr at a stable price by its producer, it was significant of today's inflationary pressures when the International Nickel Co. late in the year announced a price increase of 4.5¢ to 35¢ per lb for contract customers. At the same time the company announced a new product for alloy steel production, nickel oxide sinter, priced several cents a pound below electrolytic nickel.

LABOR PRODUCTIVITY

Labor productivity—manhour output—is an ephemeral phrase, difficult to define and still more difficult to define statistically. In an effort to shed some light on this controversial subject, a survey was conducted among metalworking plants. While the survey suggests that postwar productivity is generally poor, indications were present of an apparent upward trend. Incentive plans, closer labor-management cooperation and profit sharing were given prominence as factors contributing to high employee output.



By G. F. SULLIVAN
Associate Editor,
THE IRON AGE

CAN America maintain its present standard of living? Can it be held, or even raised, or will the current spiral of wages and prices force it down to the point where our way of life will be seriously threatened? The answer hinges on productivity.

Current information and the latest available government statistics indicate that output per manhour in the metalworking industries is at or below the 1939 level. A recent survey of labor productivity in metalworking plants conducted by THE IRON AGE also supports this conclusion, as the tabulation in fig. 1 shows. This was true for the first half of 1946, and while there is evidence of improvement that improvement appears to have been relatively slight. Certainly the gain in manhour output has not been carried much, if any, beyond the 1939 levels, whereas it should be considerably above them if it is to keep pace with our previous progress.

The actual measurement of labor productivity on a nationwide basis is a task that so far has stumped the experts. For there are several factors that enter the productivity picture aside from manhour output. Among them are technological improvements and the management and supervisory functions.

There is no doubt that inventors, engineers and machinery manufacturers are at work on the technological end. There is increasing evidence that management realizes the need for careful planning and closer supervision in these days of "start and stop" production and new laborers in the shops.

Time studies of operations carried out early in 1946 and again more recently indicate that while there has been some very encouraging improvement in recent months the figures are not yet up to prewar standards.

The present picture may not be happy, but it is not without hope. Following the war the reconversion period saw a shift of labor and foremen to new jobs. On top of this was superimposed a critical material supply condition which resulted in uneven production.

While the war developed many new tools, methods and processes in the metalworking industries, there has not been time as yet to work them all into the production scheme.

Following World War I it was a matter of from 4 to 7 yr before manhour output returned to its prewar trend level. However, the two wars were quite different in their effects on industry, and it is probably inadvisable to draw a hasty generalization on this point. World War I had no permanent effect on productivity one way or the other; productivity fell off temporarily but later returned and continued its upward trend.

Since World War II saw far more technological progress and had a heavier impact upon industry, the application of high production techniques may be more rapid. If the strike situation can be cleared up and remain so for the next 6 months a gain in manhour output of 10 to 15 pct in the metalworking industry appears likely by June 1947. Assuming the same conditions, it should be perhaps 25 pct higher in 1949 than it was just before the war. A wave of strikes, with their unbalancing effects on inventories and on production, would of course upset this trend.

Aside from attempts to increase labor productivity by increasing the efficiency of the individual worker, a trend to more highly specialized labor saving machinery is in evidence. Despite the higher cost of such equipment the tremendous increase in average hourly wages in manufacturing since 1939 now makes them a far more attractive investment, particularly in view of the low cost of borrowing money.

THE IRON AGE 1946 Labor Productivity Survey was mailed in the form shown in fig. 2. Replies capable of tabulation were received from 653 metalworking plants with from 10 to more than 25,000 employees each, and with a total employment of 783,581.

A total of 282 plants with employment of 336,287 reported their productivity was lower than it was before the war. But 131 plants employing 172,768 persons reported it higher. Replies from 240 plants indicated manhour output was "about the same" as prewar. These plants had 278,440 employees on their rolls.

As shown in the accompanying survey tabulation, table I, a majority reported they had insurance and sickness benefits, though in many different forms. Most plants indicated that they had improved working conditions and labor-management cooperation. Only two plants reported annual wage plans in effect. The latter question was introduced on the survey because of the current interest in it, despite its obviously debatable effect on productivity.

Incentive payment and profit sharing have long been considered as factors vitally affecting the productivity of labor. Pension plans, while not so widespread, are considered by some authorities as deterrents to labor turnover and so probably deserve a place in a productivity study.

Of plants reporting higher productivity, fig. 3 and table I, 59.5 pct pay incentive wages; of those showing about the same productivity 48.8 pct have incentives; while in the group reporting lower productivity 49.3 pct of the plants pay incentive wages. It should be understood that not all the plants reporting payment of incentive wages pay them to all productive employees. Some firms have reported as few as 10 pct of their productive employees on incentives.

Profit sharing plans are in effect in 16.8 pct of those plants which reported higher productivity. In the group reporting productivity essentially unchanged some 11.7 pct of the plants have profit sharing systems. Among installations reporting lower productivity, profit sharing plans are in effect in 8.9 pct.

From the results of this survey the effect of the presence or absence of a pension plan cannot be correlated with productivity. Owing to the brief general

The Iron Age Labor Productivity Survey

Question Asked:

"Excluding gains due to improved machinery and methods, do your records show any change in labor productivity (manhour output) compared with prewar figures?"

Answers From 653 Metalworking Plants:

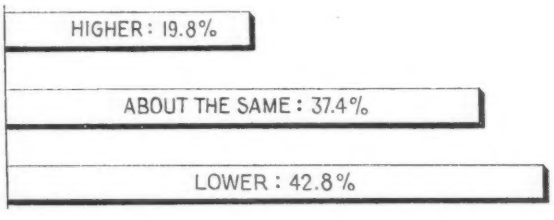


FIG. 1—Results of survey of labor productivity.

nature of the question not all replies indicated whether the pension plan applied to all wage earners. Where it was stated that only supervisory personnel were covered, the plant was not included in arriving at the figure of 21.4 to 21.7 pct of plants in all three groups having a pension plan in effect.

Wage Incentives

Modern wage incentives were born in a steel mill and first presented publicly by Frederick W. Taylor of Midvale Co. at a meeting of the American Society of Mechancal Engineers in 1895. The Taylor system was prompted by the observation that there was too much soldiering on the job and that the piecework systems then in effect were unfair. There was a constant struggle on the part of management to get more work done, and on the part of labor to earn as much as possible without getting the rate cut. At that time no one knew what constituted a fair day's work.

But as the years rolled by incentive plans were set up by untrained and inconsiderate men who pushed workers as hard as they could, got more output and then cut the rate. Eventually this abuse of incentive payment systems made the very term "incentive" a nasty word in labor's lexicon. The depression of the 30s dealt incentives another body blow—there was not enough work and it had to be spread. And as labor gained in power in the 30s it was able more successfully to resist the introduction of incentive systems.

Nevertheless, a Labor Dept[1]. survey of the machinery manufacturing industry in 1942 disclosed that average hourly earnings of incentive workers were higher than those of straight time workers. The averages were higher in unionized plants than in nonunion shops, but each group taken separately showed a pronounced excess of incentive earnings over straight time rates.

[1] *"Effect of Incentive Pay in Earnings," Monthly Labor Review, U. S. Dept. of Labor, Bureau of Labor Statistics, May,* 1943.

The attitude of most management executives using incentive payments is briefly this: The man on straight time, assuming he is a conscientious and willing worker, wastes a lot of time in the course of a day's work. If material doesn't arrive at his machine as needed he waits for it; he may shut down his machine in the middle of a cut to sharpen tools; and here and there throughout the day there are other minor interruptions, all contributing to a loss of production time.

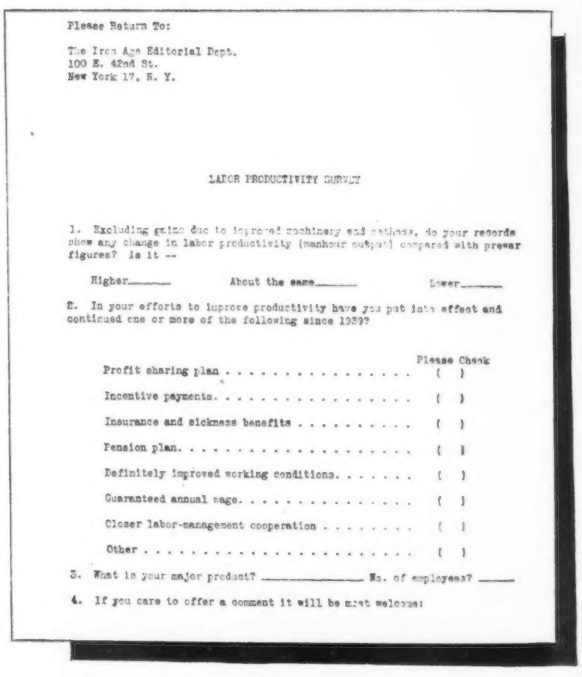
But to the man on incentive work such delays mean money down the drain. He rides the material handling man to get his raw material before he needs it; he chooses more opportune times to sharpen his tools; he makes sure his machine is set up properly so he doesn't lose time on rejects; he checks carefully on maintenance to minimize the possibility of a breakdown. In short, he has a definite financial interest in achieving maximum production. He doesn't have to put out more physical effort but he does give more thought to reducing waste time and lost motion.

What do the unions think of incentives today? Is their opposition unalterable and unqualified? The answer to the latter is a qualified "No." Even before the war, before incentive plans were showing signs of improvement as they have in recent years, the National Industrial Conference Board reported that in 1940 one of the most significant trends in this field was a change in absolute unalterable union opposition.[2] Some union leaders, according to the board, were approving incentive plans provided they were carefully controlled. This usually means that a union committee has a part in setting the rates, in making time studies of its own or in checking the rates set by management.

But the weight of evidence today still indicates that many of the larger unions are opposed to incentives.

[2] *National Industrial Conference Board, Studies in Personnel Policy No. 19. "Some Problems in Wage Incentive Administration," New York, February,* 1940, 23 *p.*

Even during the dark days of the war, in the fall of 1943, when many old principles were sacrificed to patriotism both the American Federation of Labor and the United Automobile Workers (CIO) expressed their opposition when the War Production Board advocated incentives as a means of increasing productivity. At that time, however, the United Electrical, Radio and Machine Workers (CIO) endorsed incentive systems as a means of attaining greater production providing the systems were protected with the proper safeguards (i. e. union participation).



Please Return To:

The Iron Age Editorial Dept.
100 E. 42nd St.
New York 17, N. Y.

LABOR PRODUCTIVITY SURVEY

1. Excluding gains due to improved machinery and methods, do your records show any change in labor productivity (manhour output) compared with prewar figures? Is it --

Higher_____ About the same_____ Lower_____

2. In your efforts to improve productivity have you put into effect and continued one or more of the following since 1939?

	Please Check
Profit sharing plan	( )
Incentive payments	( )
Insurance and sickness benefits	( )
Pension plan	( )
Definitely improved working conditions	( )
Guaranteed annual wage	( )
Closer labor-management cooperation	( )
Other	( )

3. What is your major product? _____ No. of employees? _____

4. If you care to offer a comment it will be most welcome:

FIG. 2—Questionnaire used in productivity survey.

The UAW-CIO position on incentives today is expressed by Richard Leonard, UAW vice-president, who declared recently that his union "is formally committed

against any spread of incentive plans throughout the [automobile] industry." He added that the union would permit established plans to remain in effect but would not permit the establishment of new ones. Conceding that the general level of hourly earnings was higher where incentive systems were in effect, Mr. Leonard stated that opposition to them would continue "until management could convince the average man" that such systems were not paid for in "increased worker fatigue and a shorter working life."

The incentive plan of the Lincoln Electric Co. is too well known and has been so thoroughly covered in the past that it would be superfluous to detail it here, but no discussion of incentive pay could be complete without mention of it. Lincoln began free life insurance in 1915, paid vacations in 1923, a bonus in 1934, and a pension plan in 1936. Lincoln workers average more than $5000 a yr; the company, starting from scratch in the early 1900s built up a business of more than $30 million annually by stepping up productivity and sharing benefits with its workers and consumers.

Several new developments in incentive plans have been introduced during the past year. There has been more inclination to include employee representation in these plans and less tendency to pit workers against each other. The increased use of trained time study engineers and an appreciation of the abuses which have caused labor opposition in the past are being coupled with efforts to acquaint labor with all the facts upon which they are based.

"Measured day work," an incentive plan that improves quality, reduces spoilage and encourages employee suggestions is one of the more promising new systems. In one plant using it in place of the typical incentive system, written grievances among the 1800 workers were reduced from a rate of one to three a day to an all-time plant record of having only one written grievance presented in a period of over 4 months. It was outlined to an American Management Assn. production conference in Chicago on Nov. 15, 1946 by F. A. Schotters, formerly vice-president, Crosley Corp., Cincinnati.

In the measured day work plan a rate bracket is set up with a starting rate which would compare with a base rate used in an incentive plan and the top or standard rate equal to the average earnings under an incentive plan. The starting rate would be in effect during the time of training or until the employee is able to produce at the standard set for the operation. Employees are informed of their production v. standards each day, and inability to maintain standard average production without cause makes the employee subject to transfer to a job he can perform. Otherwise he is subject to dismissal.

FIG. 3—Effect of profit sharing plans and incentive wages on labor productivity.

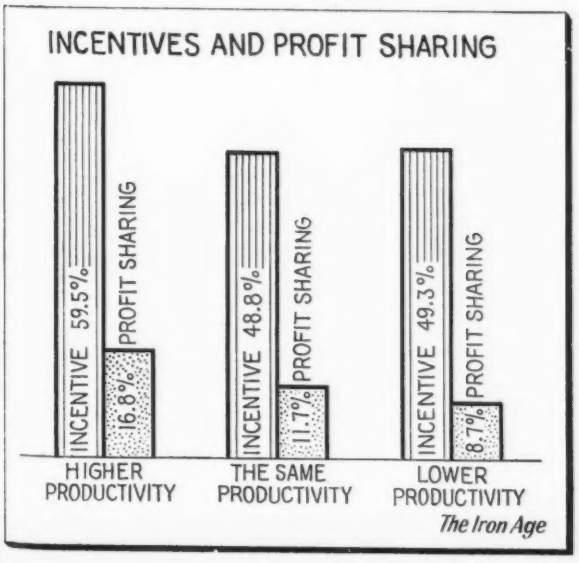


TABLE I

Tabulation of Survey of Labor Productivity

Factors Reported Upon	Percentage of Plants in Each Group Reporting Items at Left		
	Higher	Same	Lower
Profit sharing plan	16.8	11.7	8.9
Incentive payments	56.5	48.8	49.3
Insurance and sickness benefits	60.3	63.3	62.4
Pension plan	21.4	21.7	21.6
Definitely improved working conditions	70.2	69.2	72.0
Closer labor management cooperation	68.7	61.3	64.9

Note: Annual wage not tabulated because of small sample.

While the plan has lessened labor difficulties, reduced scrap and spoilage and induced workers to develop short cuts, it has certain shortcomings. According to the National Industrial Conference Board, a gradual decline of effort and a gradual departure from absolute standard have been noted where the plan was in operation. Experience has shown, the board states, that adverse tendencies can be guarded against in operating it, and it is the responsibility of foremen and supervisors to see that such tendencies are overcome.

Another method of paying workers more for increased output is that used by the Bundy Tubing Co. (See THE IRON AGE, Oct. 31, 1946, p. 92). Called a cost savings sharing plan, and not a piecework system, it pays off by collective effort. It avoids pitting one employee against another as many incentive plans do. It operates by sharing reduced production costs with hourly rated employees on a 50-50 basis. Bundy officials estimate that it increased worker efficiency 35 pct in its first 6 months of operation. How it will fare in a period of falling wages, prices and demand is open to question, company officials state.

Incentive plans are no guarantee of lower unit cost. True they almost invariably increase output, but without proper supervision they do not assure more goods at lower cost—the obvious objective of any drive to increase productivity. But the use of well thought out and scientifically operated plans is on the increase. With properly handled industrial relations it is believed that union opposition will continue to decline though it is expected to take years to break through the barriers set up by many union leaders.

Profit Sharing

Profit sharing is commonly understood as the distribution of a share of the profits of a company among its employees on some basis other than individual efficiency or accomplishment. It is held that workers who have a share in the profits of an enterprise are more productive. They feel they are to some extent working for themselves. Usually they are closer to management in their understanding of the business and the relationship of costs to earnings.

The Cleveland Twist Drill Co. initiated such a plan

in 1915. Eastman Kodak Co. began it in 1912 and Fairbanks Morse, with a record of 100 yr of industrial peace, began sharing profits with its employees in 1937.

To be worth its salt productionwise, profit sharing must start by paying the going wage rates as a minimum base with shared profits added as a plus value.

Wage incentive payments and profit sharing are not mutually exclusive though one steel company maintains that incentive payments are the worker's means of sharing profits. The theory here is that management, whose efforts can only be measured by final results, and which must assume the responsibility for low returns, should be the only sharer with capital in earnings at the end of a given period.

In the past many profit sharing systems have been started and dropped. Where management's attitude was such that it appeared it was making a gift to labor, the results have been poor. Many plans started just before the depression evaporated, when profits vanished and others were poorly worked out and imperfectly understood by the sharers.

The General Electric Co. adopted profit sharing in 1920, Westinghouse in 1936. Both these companies had long and bitter strikes in 1946 and spokesmen for both firms have often indicated during the past year that labor productivity was considerably below its prewar level. Some observers believe that where profit sharing had been in existence for a long time in a company the employees gradually assume it is a regular part of the pay envelope and it loses its effect.

This is undoubtedly true in many cases. Yet in others the loss of profits during the depression of the 30s made employees more conscious of the fact they were actually participating in the profits. The ILG Electric Ventilating Co., Chicago, whose plan was started in 1908 reported that failure of the plan to pay in 8 yr out of the first 30 made its employees profit conscious. Similarly, Eastman Kodak employees saw their payments under profit sharing vanish in 1934 and emerged from the depression with a new appreciation for the plan since they saw how it worked and realized that the words meant just what they said.

Combining profit sharing and retirement benefits in a single plan, the Joslyn Mfg. & Supply Co., Chicago, has a remarkably fine system which has been in effect since 1919. Typical cases include a warehouse truck operator who had $12,000 to his credit when he retired after 15 yr; another warehouse employee retired at age 60 after 19 yr with the company, he received $31,300 in cash.

According to M. L. Joslyn, president of the company,

What They Say

Here are comments from personnel managers and other executives of metalworking plants throughout the country. The plants covered below have an average employment of 1120, and range in size from 146 employees to 6000.

Typical comments from those reporting increased productivity:

"During the past 12 months there has been a substantial increase in the productivity of labor resulting from: (1) More efficient managerial controls; (2) closer coordination of top management and all levels of supervision; (3) new machinery and equipment; (4) new plant layout."

—*Oil well equipment*

"There is still improvement to be made in the replacement of war-acquired marginal workers by more efficient employees."

—*Industrial instrument manufacturer*

"Under a piecework or group bonus system of incentive payments we find productivity much increased."

—*Bicycles*

"We are enjoying highest production per manhour and still increasing it, due mostly to close contact and full information on company policies and status on a friendly basis with supervisors, union and employees."

—*Metal stampings*

"We have installed a sound incentive system in which our employees have implicit trust. The results have been eminently satisfactory . . ."

—*Electrical equipment*

"Closer cooperation between management and the man on the job has not only increased production but is our answer to many labor problems."

—*Farm implements*

"Increase in labor productivity due partly to extension of incentives and new methods."

—*Saws*

"Hourly productive workers have decided to dispense with their own self-imposed production limitations."

—*Transportation equipment*

"Our incentive plan . . . is still showing a very definite productivity inclination. We will, without a doubt, continue to use it. Labor-management cooperation has taken a turn for the better for the past 9 months. The union has shown a marked increase in cooperative attitude . . ."

—*Bed springs*

"Our productivity is 7 pct higher than it was in 1945 and 15 pct better than in 1940 . . . We have a profit sharing plan."

—*Engines and compressors*

"We use incentive payments. Our productivity is about 15 pct higher than prewar."

—*Steel tubing*

Remarks from companies whose productivity is about the same as it was before the war:

"We would lay the maintenance of productivity entirely to having a piecework system. Incentives are basic—everything else has relatively little effect."

—*Ball bearings*

"Difficulties with raw material supplies and the substituting of materials are the greatest deterrents to satisfactory production records."

—*Steel fabricator*

"Better supervision—foremen's conferences weekly during the lunch period at which time production problems are discussed . . . Safety programs . . ."

—*Machine tools*

"The two factors we credit as most influential in stimulating productivity are: (1) A good incentive system that, added to fair base rates, permits earnings at least average for the area; (2) absence of labor trouble . . . unaffiliated union . . . excellent labor relations. Profit sharing, pension plans, group life insurance, etc., are n substitutes for the above."

—*Machinery*

testifying before a subcommittee of the U. S. Senate Committee on Finance in the fall of 1938, he surveyed 60 of the largest corporations in the country with his plan in mind. He said, "We don't find one that it wouldn't work perfectly in, on their record for the last 10 yr . . . and we thoroughly believe that (if they had instituted the Joslyn plan) there would not have been a murmur of labor trouble of any kind. . . ."

Reconversion following the war has injected so many deterrents to smooth and efficient productivity that any analysis of the results obtained here must necessarily take them into effect. These include strikes in other plants and industries and frequent raw material shortages, both contributing to "start and stop" production.

Further reconversion problems which *are* under the control of the individual and therefore *do* reflect on labor productivity are high absentee rates, excessive labor turnover, general restlessness, war weariness, featherbedding and too much reliance on the strength of the unions.

Summary

Taking all these factors into account, the weight of evidence appears to support the following conclusions. Incentive payments properly set up, scientifically operated and fully understood by the employee, will, the unions permitting, tend to increase productivity. The same appears true, again with the obvious qualifications, of profit sharing systems. A third factor, not indicated by the figures, but so obvious it hardly bears repeating is borne out by comments and letters accompanying the replies. It is the matter of real understanding and cooperation between management and labor.

Perhaps the most encouraging note sounded in replies from personnel managers and operating executives in the metalworking field is that labor-management cooperation appears to be on the increase. It has for so many years been a one-sided affair that no immediate and sweeping reversal can be expected overnight, but there are hopeful signs that it is improving.

Finally, and most important, there are definite indications that labor productivity improved during 1946. Two large automobile manufacturers, queried by letter but not included in the survey figures, reported a modest improvement and indicated that the trend was encouraging. A number of comments received on the survey indicated that the writers saw little hope for improvement under present conditions but others reported signs that productivity in their plants was on the way up.

About Productivity

"We have an incentive system which seems to do most for our productivity."

—Washing machines

"Productivity controlled by 100-pct incentive plan in use for many years. Unit cost, however, is greater due to increased wages."

—Steel springs

"Incentives are the single best answer to increased productivity."

—Heavy machinery parts

"We are proud of the production record of 90 pct of our employees—and if the 90 pct would assert themselves in relation to the other 10 pct our problems would soon be normal."

—Farm equipment

From companies reporting lower productivity:

"Material shortages and lack of female factory help have interferred with production efficiency . . . High absenteeism and turnover have also been a contributing factor . . ."

—Radio parts

"Productivity shows signs of increasing by the first of the year."

—Transformer manufacturer

"Manhour output will never reach prewar figures until we can get rid of the union committees, regulations, etc., fostered by the Wagner Act."

—Machinery

"Supervisors are partly responsible for the poor showing by labor. They've forgotten how to supervise because during the war period we had to be cautious of what we expected of our people."

—Radio tubes

"Since affiliation with labor union our production per manhour has dropped."

—Iron foundry

"We find the productivity of our older employees holding up quite well but new employees are not producing nearly as well. The increased labor turnover also is reflected in manhour output because of the large number of employees we must break in."

—Washing and ironing machines

"The Wagner Act needs some revision if labor and management are ever to work in closer harmony for the good of all."

—Bicycle parts

"See some improvement in labor productivity but still too much agitation and coddling by Washington."

Structural steel fabricator

"We believe incentive pay would improve manhour output but the union does also."

—Gray iron foundry

"Our output per manhour is improving."

—Electrical switching equipment

"Since the 18½¢ hourly increase there has been a definite drop in manhour output in spite of the CIO pledge to give us more production."

—Railway castings

"Your survey is inadequate because it does not go far enough. Angles not covered in your questions cause the lower manhour output, and as a result the questions are irritating. (1) An increase in the number of workers means we have more 'green' men and it takes time to train them. (2) Defective castings and materials are causing high costs. (3) Government coddling cannot be overcome in a year. (4) Shop executives are tired just as the men are and pressure has not turned the tide as yet. (5) Heavy turnover in labor seeking new jobs; turnover on our second and third shifts is high because men want and can get daylight jobs . . ."

—Powered cranes and shovels

U. S. STOCKPILES

Despite the acknowledged need for such a program, government stockpiling of strategic and critical materials is lagging behind schedule and is now little further advanced than on VJ-Day. Causes of this lag are many and varied, not the least of which was the possibility that intensive buying of such materials during the past year might have an adverse effect upon civilian industrial economy. With $100 million assigned for stockpiling purchases in 1946, and the probability of this sum being at least doubled in 1947, considerable caution will be required by government agencies if such purchases are not to seriously affect domestic price levels.

By KARL RANNELLS
Washington Bureau
THE IRON AGE

DESPITE the generally accepted belief that in the interest of self-defense it is essential that this nation establish adequate stockpiles of strategic materials, the United States is now, 1½ yr since the end of World War II, in little or no better position in this respect than it was during the war years. This situation may be attributed to a number of reasons. One is the desperate need for many of these short supply materials for civilian production which had been starved during the war. Obviously, any heavy acquisitions for stockpiling of materials already in short supply would disrupt the industrial economy. A second factor was the slowness of the nation in adopting and getting started on a sound program of this type. It was virtually a year after the end of the war before authorization was granted and funds made available for purchasing materials to be placed in reserve.

Still another basic cause is that the flow of most items which had to be purchased abroad began slacking off when the shooting stopped. This was due partly to controlled American prices which in some cases were below the world market and partly because the supplying nations themselves were also short in many of these materials and minerals.

$1.8 Billion Stockpiling Program

The present stockpiling program involves acquisition of $1.8 billion worth of materials over a period of 5 yr, involving upwards of 100 items, of which approximately 65 are metals and minerals, from more than 50 countries. During the war, 27 of these items were obtainable only from abroad, including vital minerals used in the field of electronics, such as quartz crystals, high grade mica, tantalite, etc. Also on this list were such items as beryl, tin, diamonds and natural rubber. In addition, 38 other commodities had to be imported in large quantities because domestic production, although aided by high prices and subsidization, could not meet essential demands.

As an example, during the war period the United States was 100 pct dependent upon foreign sources for such items as tin and nickel, more than 80 pct dependent for antimony, 85 pct for manganese, 60 pct for tungsten, and nearly 45 pct for copper and lead.

"Experience has proved that the mining and other production of raw materials cannot, without many difficulties, be expanded to meet the rapidly increasing demands of our military services (in the event of war)," high military officials reported confidently to Congress when the stockpiling bill was under consideration. "Sometimes it has been necessary (during the war) to adopt extraordinary measures such as furloughing of soldiers to work the mines in order to increase production of copper and zinc. It has been necessary in some cases to establish costly incentives. Many less desirable materials had to be substituted for materials available elsewhere in the world, with the result that the end products were often less useful or less convenient."

Then these military officials added this warning: "Domestic production of certain minerals and metals during the war increased beyond all previous records and our reserves have been depleted at an alarming rate. The quantity of minerals produced in 1943, for instance, was 57 pct greater than the output in 1918 and 23 pct above the boom year of 1929. Unless new reserves are discovered, our country in the future will be even more dependent upon foreign sources than in the past. To a large extent, stockpile goals must be raised."

Supporting the contention of Army and Navy officials is a Bureau of Mines estimate that of its original commercial reserves, the United States has now used up 97 pct of its known mercury supply, more than 80 pct of its lead, 75 pct of its chromium, 70 pct of its bauxite, and more than 60 pct of its tungsten, zinc and copper. On the basis of these estimates, and without imports, this country would exhaust its known reserves of copper in 34 yr at even the prewar rate of use. Similarly, reserves of zinc would run out in about 19 yr, lead in 12, bauxite in 9, vanadium in 7, antimony and tungsten in 4, mercury in 3, and manganese in 2. Chromite and nickel are already virtually exhausted.

Despite the apparent slowness in getting started, the nation is definitely committed to acquiring adequate reserve stocks to meet emergency needs. This was assured with the passage last July of Public Law 520, better known as the "stockpiling act," and the appropriation of an initial fund with which to begin peacetime stockpiling.

First Funds Awarded in 1938

Enactment of the legislation marked the successful conclusion of a struggle by the military which began shortly after World War I. The first move toward acquisition of reserves of short materials came in 1938 when the Navy succeeded in getting $3½ million of its appropriations earmarked specifically for the purpose. During the ensuing 2 yr, an additional $1 million was granted. With these funds, the Navy went into the markets and purchased small stocks of tin, ferromanganese, tungsten ore, chromite, optical glass, etc.

It was not until 1939 that the first actual stockpiling legislation was passed. Under this act, about $55 million was made available and expended. At the time this appeared to be a substantial amount of money for such a project but by the following year, what with our own defense program plus the heavy demands to fill war orders from France and England, it became increasingly evident that even this amount was inadequate for the times.

As the law then stood, it provided for no public purchase activity. This was changed in 1940 when a second stockpiling act conferred much broader powers.

Private Purchasing of RFC Stocks

Generally speaking, purchasing of materials from RFC (OMR) stocks is regulated by Priority Regulation 34. Those items that are under specific commodity limitation orders require CPA authorization and the application to purchase must be made in accordance with those orders. For others, application may be made by letter. In the latter case, the letter must state (1) purpose for which required, (2) present inventory, (3) days supply represented by present inventory, plus amount requested, (4) efforts to obtain and use a substitute, (5) efforts to obtain material elsewhere and (6) other pertinent information. A table giving recent revisions in PR 34 rules for purchasing is given below. The foregoing information applies only to materials held as government stocks by the Office of Metals Reserve, Reconstruction Finance Corp. Also, it includes only those items of table A, Priorities Regulation 34, for which purchasing regulations were changed as of Dec. 17, 1946. Remaining items are still subject to former PR 34 rules for purchase.

Revised Purchase Rules (PR 34) for OMR Stocks

Material	CPA Division or Branch Responsible	Who Is Eligible to Purchase	How to Apply
Aluminum, primary pig	Aluminum and Magnesium Branch	Primary producers	By letter
Antimony, metal, ore, concentrates, liquated	Tin, Lead and Zinc Branch		GP Order M-112
Asbestos: Rhodesian chrysotile (grades C, G-1, C and G-3); African Amosite (Grades M-1, 3-DM-1); Cape Blue	Cork, Asbestos and Fibrous Glass Branch	Manufacturers of building material	By letter
Beryl	Miscellaneous Minerals and Mining Branch	Processors	By letter
Bismuth metal	Tin, Lead and Zinc Branch	Armed Forces Emergency health	By letter
*Alloys or scrap containing 50 pct metallic bismuth	Tin, Lead and Zinc Branch	Smelters and reprocessors	Certified order
Cadmium metal	Tin, Lead and Zinc Branch	Processors for emergency use	By letter
*Finished alloys containing cadmium	Tin, Lead and Zinc Branch	Reprocessors and smelters	Certified order
*Scrap containing 50 pct or more cadmium	Tin, Lead and Zinc Branch	Reprocessors and smelters	Certified order
Chromite	Steel Branch	Processors, users	By letter
Copper	Copper Branch	Brass and wire mills, ingot makers	Form CPA-4542
Corundum	Miscellaneous Minerals and Mining Branch	Processors	By letter
Graphite	Miscellaneous Minerals and Mining Branch	Processors	By letter
Kyanite	Miscellaneous Minerals and Mining Branch	Processors	By letter
Lead, pig	Tin, Lead and Zinc Branch	Processors	General Pref. Order M-38
*Alloys containing 50 pct lead	Tin, Lead and Zinc Branch	Smelters and reprocessors	Certified order
Manganese	Steel Branch	Processors, users	By letter
Mica	Miscellaneous Minerals and Mining Branch	Fabricators	By letter
*Nickel, oxide	Steel Branch	Smelters and reprocessors	Certified order
Platinum, refined	Miscellaneous Minerals and Mining Branch	Processors	By letter
Quartz crystals	Miscellaneous Minerals and Mining Branch	Processors	By letter
Tin, pig	Tin, Lead and Zinc Branch	Processors	Cons. order M-43
*Alloy or scrap containing 50 pct or more tin	Tin, Lead and Zinc Branch	Smelters and reprocessors	Certified order
Zinc	Tin, Lead and Zinc Branch	Emergency users	By letter
*Alloys, containing 50 pct or more zinc	Tin, Lead and Zinc Branch	Smelters and reprocessors	Certified order

* Do not require specific CPA authorization to purchase.

How Stockpile Materials Are Purchased and Released

Acquisition: Decision as to what are and are not critical or strategic materials, as well as the quality and quantity to be purchased, is the responsibility of the Army-Navy Munitions Board, acting on the recommendations of the War, Navy and Interior Depts. Cooperating with the latter are the State, Commerce, Treasury and Agriculture Depts. and industry advisory committees. On direction of the ANMB, actual purchases are made by the Bureau of Federal Supply (formerly the Treasury Procurement Division) which acquires the material from any available sources with due consideration to civilian deficiencies and provisions of the "Buy American Act."

Disposal: No materials may be released from the permanent (military) stockpile except by order of the President or an agency designated to act for him. Since stockpile surpluses and their disposal are not expected to offer an immediate problem, there is no clear-cut procedure at present. A careful check of all interested agencies suggests that an executive order for release of materials from the stockpile would also contain specific instructions for disposal of items in short industrial supply. In lieu of specific directions, the released materials would normally revert to the BFS which holds title to all materials it has purchased for the stockpile. In this instance, it is further presumed that the surplus stockpile materials would be turned over by the Treasury to OMR for inclusion in its inventories which currently may be drawn on for commercial use, in most cases only through allocations by the Civilian Production Administration.

A third bill was enacted in July, 1946, which set up machinery for carrying out a 5-yr stockpile procurement program, the first real peacetime provision for the accumulation of national reserves of critical and strategic materials.

Briefly, the existing law delegates to the Army-Navy-Munitions Board the authority and responsibility of determining what are and what are not critical and strategic materials as well as fixing the quantities of each which should be acquired and stored. In this respect, the ANMB is acting as the representative of the War and Navy Depts. and must work in cooperation with the State, Treasury, Commerce and Agriculture Depts.

More important are the provisions which permit release of materials from the stockpile under carefully restricted conditions. Since military requirements are under constant review with an eye to new developments, it is probable that some items may be removed from time to time. For instance, kapok is no longer a needed material because it has been found that spun glass can be substituted for almost every requirement. Also, the law provides that specific amounts of certain materials may be released from the permanent stockpiles if such materials should become surplus or are no longer needed in view of new developments. Such releases may be considered remote, however, since the ANMB is constantly revising its requirements in view of changing developments and possible needs.

It should be made plain that only an order by the President or an agency designated by him can release material from the permanent (military) stockpile. And nothing short of direct national emergency is likely to bring forth such an order. The limited allocations which are now made to alleviate civilian deficiencies are made from inventories held by government agencies, largely RFC.

While the amounts considered adequate for reserves, the amounts already held and the amounts to be required are kept under a secrecy rating, it is no secret what the materials are. They are separated into three groups which the board dsignates as groups A, B, and C. Table I lists the materials in each group.

In conjunction with the report, it is expected that the board will request additional funds for the remainder of the current fiscal year, ending June 30, to speed up the program. Also, reliable sources say the board will ask that the full prorated amount, $360 million, be made available for the fiscal year 1947-48. If these budget requests are granted, the amount available for stockpiling purchases over the next 18 months will amount to something more than $600 million.

As enacted last July, the overall program as worked out by the military services and the now defunct War Production Board called for the acquisition of a $2.1 billion stockpile. It was estimated, however, that about $300 million worth could be salvaged from war surpluses, leaving roughly a balance of $1.8 billion to be expended. This was the amount approved by Congress in the legislation; it would be expended at the rate of $360 million annually.

It was recognized, however, that such a purchase rate during the first year would have a tremendous impact upon the general industrial economy, then in the throes of reconversion and suffering serious material shortages. The military departments trimmed their request for the first 12 months to $270 million and selected a list of items which was approved by CPA as being least likely to upset the industrial situation.

This amount was pared to $250 million by the Budget Bureau and approved by the Administration as well as by the House and Senate Appropriation Committees. Congress, in its haste to adjourn, further trimmed the sum to $100 million before final action. In view of the lagging program and the fact that a number of the items are obtainable largely from abroad, it is certain that at least a doubling of the amount now available will be sought for the first half of 1947 and the full amount requested for next year.

Assuming that the additional funds are granted, the effect of stockpile buying in the present tight domestic and world markets will depend upon how the purchasing is done. The Act, while qualified with the clause "so far as is practicable," provides that procurement shall be confined to "supplies of material in excess of current industrial demand." If this policy is followed, the buying should not seriously affect domestic prices.

TABLE I

Current List of Stockpile Materials

Source: Army-Navy Munitions Board

Group A[1]

Agar	Graphite	Pyrethrum
Antimony	Hyoscine	Quartz crystals
Asbestos	Iodine	Quebracho
Bauxite	Iridium	Quinidine
Baddeleyite	Jewel bearings	Quinine
Beryl	Kyanite, Indian	Rapeseed oil
Bismuth	Lead	Rubber (crude, natural)
Cadmium	Manganese ore	Rutile
Castor Oil	Manila fiber	Sapphire and Ruby
Celestite	Mercury	Shellac
Chromite	Mica	Sisal
Cobalt	Monazite	Sperm oil
Coconut Oil	Nickel	Talc
Columbite	Opium	Tantalite
Copper	Optical glass	Tung oil
Corundum	Palm oil	Tungsten
Diamonds, industrial	Pepper	Vanadium
Emetine	Platinum	Zinc
		Zircon

Group B[2]

Aluminum	Fluorspar (acid and metallurgical)	Osmium
Barite	Graphite (crystalline fines)	Palladium
Chalk, English	Magnesium	Rhodium
Chromite (chemical grade)	Mica (specific grades)	Ruthenium
Cryolite (natural)	Molybdenum	Selenium
Diamond dies		Talc (steatite, ground)
Emery		Wool

Group C[3]

Asbestos (Canadian chrysotile)	Jute	Mahogany
Bristles (pig and hog)	Cork	Petroleum and its products
Burlap, jute	Sesame oil	Radium
Hemp, American	Leather	Iron ore
Henequen	Loofa sponges	Iron and steel scrap
	Balsa wood	

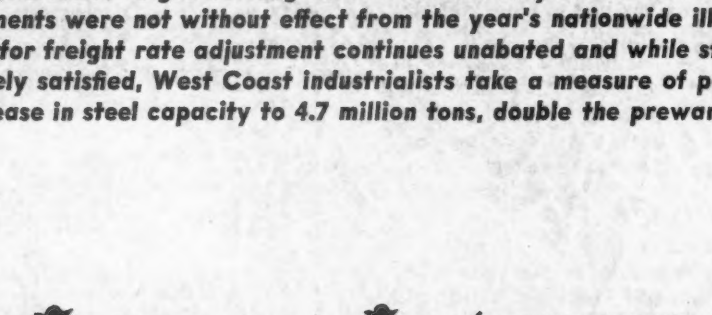
[1] Group A materials are those for which stockpiling is deemed the only satisfactory means of assuring an adequate supply in the event of an emergency. Five of the items (asbestos, iodine, quinine, rubber, opium) require special storage conditions; 11 (castor, coconut, rapeseed, palm, tung and sperm oils, cordage fibers, pyrethrum, rubber, shellac) require rotation of stocks; opium stocks to be held by the Treasury's Narcotics Bureau. Specific grades of items listed above are as follows: Asbestos, Rhodesian chrysotile and South African Amosite; chromite—metallurgical and refractory grades, Rhodesian origin; graphite—armorphous lump and flake; manganese—battery and metallurgical grades; mica—Muscovite block and film, Muscovite and phlogopite splittings; talc—steatite, block or lava.

[2] Group B materials are those practicable for stockpiling but recommended for acquisition to limited extent because adequate supplies can be obtained normally through stimulated production or by use of substitutes. One item, magnesium, requires special storage conditions. Specific grades for above items are: Fluospar—acid and metallurgical grades; mica—Muscovite and phlogopite block.

[3] Group C differs from groups A and B in that while all are critical and strategic materials none are recommended for stockpiling. With the exception of iron ore, iron and steel scrap, and balsa and mahogany wood, all require either or both special storage conditions and rotation of stocks.

WEST COAST

The ebullient West Coast, displaying remarkable resiliency to the stresses of postwar industrial conversion, chalked up further accomplishments in 1946 in its drive for a greater degree of self-sufficiency for the area. These achievements were not without effect from the year's nationwide ills. The crusade for freight rate adjustment continues unabated and while still not completely satisfied, West Coast industrialists take a measure of pride in the increase in steel capacity to 4.7 million tons, double the prewar level.



By R. T. REINHARDT
West Coast Regional Editor
THE IRON AGE

AN industrial revolution is changing the economic pattern of the West as surely, if not as swiftly, as the discovery of gold in California almost 100 yr ago converted a sleepy range country into a bustling land where courageous and adventurous men dug and fought for wealth.

Historically pastoral and rich in varied raw materials, the West first felt the feeble pulse of an independent industrial economy with the opening of the Panama Canal, and after World War I manufacturers and industrialists began in earnest to take more advantage of local resources and supply additional requirements for farm and logging machinery, maritime equipment and food processing plants. Aircraft manufacturers began small operations, a few home appliance plants started and chemical industries took root.

The full effect of the expansion was not released, however, until the demands of World War II suddenly thrust the West into the cauldron of production to turn out ships, aircraft, incendiaries, light metals, steel and other materiel of war.

Business leaders, tempered by this plunge into industrialization, were convinced that the West was ready for greater progress, and when it became evident that the cotton pickers, sheep herders, cattlemen, farmers, machinists and tradesmen who had come West by the millions to man the machines of war intended to stay and provide a greater labor force and larger consumer market, the furnaces of production were tapped to teem the resources of the western states into the mold of a more completely integrated and independent economic unit.

Dependence upon the eastern part of the United States for most of the fabricated products demanded in the area has always galled western business men, who likened their western economy to a steel plant where all facilities for integration except the basic blast furnace were available.

Encouraged by the more than 20 pct increase in population in the seven western states since 1940, and taking into consideration warborn developments of basic industries such as steel, industrialists have expanded old facilities, built plants for manufacture of products never before made west of the Rockies and gambled on the continual growth of this section.

Contradicting the prognostications made by some economists and business leaders, the accelerated wartime increase in population in the western states has not seriously fallen off. Gains in population made by the Pacific Coast states and Nevada, Utah and Arizona have declined but little, and the forecasters are now predicting continued increases in the next 15 yr which assume astronomical proportions when viewed in the light of the growth in prewar years.

Equally amazing to many observers is the continued high employment in manufacturing and industrial fields and the moderate or negligible return of war plant trained factory workers to the more familiar occupations of farming, lumbering, fishing and the service trades.

The economic revolution of the West has progressed with such rapidity that statistics which could substantiate trends are considerably behind actual conditions. However, the importance and strength of manufacturing in the economic life of the Pacific Coast states are shown in part by the number of employees in this field. In California in November 1946 there were 710,000, as against 416,000 in 1940. Oregon likewise showed a substantial increase with 81,600 in 1940 and 124,700 in November, 1946. Washington's figures are: August 1940, 127,000 and November 1946, 180,600. California's manufacturing employment peak during the war was 1,191,000; Oregon's, 212,000 and Washington's 319,600. California's employment in durable goods industries in April 1940 was 187,000 and in October 1946, 379,000. Table I shows the trend of employment in three West Coast states.

Per capita income in the three Pacific Coast states and Nevada was approximately 25 pct above the national average and California with $1,480 per capita income was second only to New York with $1,595 per capita income. Fig. 1 shows percent of total state nonagricultural employment engaged in manufacturing in the West. These data are from the U. S. Bureau of Labor Statistics.

The long road over which western industry has fought its way to its present high degree of independence has not been entirely free of obstacles. Perhaps the most serious have been the inability of western manufacturers to get delivery on parts and semifinished materials, and labor difficulties.

These stumbling blocks are not unfamiliar to industrialists throughout the United States but in this accelerated transitional period in the West they assume importance out of proportion. For example, the scarcity of steel sheets and such components as fractional horsepower motors and small gasoline engines is greatly retarding the expansion of many plants.

Labor unrest has followed the national pattern rather faithfully and where the percentage of mandays lost in relation to the total state employment has been higher than in other parts of the country, there is some reason to believe that this is attributable in part to the growing pains of adolescent industry.

Basis for Progress Is Steel

Unquestionably the expansion of the steel industry in the West is the largest single factor which speeded up its industrial revolution. Total ingot capacity in the 11 western states has been more than doubled since 1938 from approximately 2,000,000 tons to about 4,750,000 tons per yr. Unfortunately, this expansion is not geared to the production of those products most essential to a normal peacetime market. However,

when it is realized that present ingot tonnage represents about 5 pct of the country's steel capacity, as compared to half of that prewar, and that projects and plans are now afoot to alter the rolling facilities of the Kaiser Co., Inc. at Fontana, and of the U. S. Steel Corp. subsidiary at Geneva, Utah, for the production of sheets, tinplate and welded pipe, it is evident that the western demand is in line to be satisfied to a large extent from local sources. Increases in the production of steel in the West were brought about largely through the construction of Utah and California integrated plants and therefore the seven western states show an even greater percentage of expansion than when all of the 11 western states are taken into consideration. In prewar years, capacity in the seven western states was approximately 1 million ingot tons and today it is approximately 3½ million tons which is an increase of 250 pct. Naturally the wartime finishing facilities of the two new plants were devoted to the

TABLE II

Rolling Capacity of the Steel Industry in 11 Western States*

	Net Tons (000 omitted)	
Finished hot-rolled products:		
Plates	1,025.2	
Sheet and strip	100.9	
Structural shapes (heavy)	339.3	
Structural shapes (light)	102.5	
Wire rods and flats	382.3	
Bars, concrete and reinforcing	306.6	
Bars, other	359.9	
Rails, tie plates, and splice bars	455.9	
Total	3,163.6	
Other finished products:[a]		
Wire: Plain, galvanized, barbed and twisted	375.3	
Springs	65.9	
Bolts, nuts, rivets and spikes	61.0	
Nails and staples	57.0	
Galvanized sheets	55.7	
Pipe (electric weld)	35.8	
Fabricated reinforcing bars	31.4	
Fencing	30.9	
Castings and press hammer and forging	48.1	
Other finished products[b]	37.8	
Total	798.9	
TOTAL		3,962.5

* Source: "Steel and Steel-Using Industries of California," by E. T. Grether, p. 115.

[a] Includes to some extent, capacity of fabricating plants not connected with rolling mills. This is known to be true, for example, of the pipe capacity listed.

[b] Includes rope and strand, fabricated steel towers, light structural angles, pickled black sheets, bars and bronze castings, and miscellaneous products.

production of those forms of steel necessary to the gigantic shipbuilding program and but little equipment could be installed for the production of anything other than war materiel. Consequently, the great lack at this time is in facilities to roll such products as sheets, tinplate, light structurals and tubular products. West Coast rolling capacity, by product, is tabulated in table II, while table III gives a comparison of West Coast ingot capacity for 1938 and 1945 by company.

It has been estimated by several sources that prewar consumption of all rolled products amounted to about 2½ million tons in the 11 western states and slightly more than 2 million tons of this amount were consumed in the seven states west of the Rockies.

Various estimates have been made of the possible future consumption of rolled steel products in the seven western states ranging from a low of 2½ million tons to more than 3½ million tons. It is very doubtful if any accurate prognostication can be made on consumption because of the lack of consistency in the increase and type of manufacturing. One thing is certain: The steel sheet shortage will continue throughout the West for a year or more and relief will come only from installation of sheet mills at Geneva or Fontana, or through start of operations at the new mills of Bethlehem Steel Co. at Sparrows Point, Md. This latter project has been delayed and probably will not begin production before the third quarter of 1947.

The 120,000 ton sheet capacity of the two mills of Columbia Steel Co. in California is inadequate to meet western requirements and half of that capacity will be eliminated when the Pittsburg, Calif., mills are shut down early in 1947 to permit completion of the installation of cold-rolling facilities.

New Steel Facilities

It is an open secret that the Kaiser Co., Inc., has been considering the possibility of converting its plate mill at Fontana to the production of sheet and strip, but until a more satisfactory arrangement is made between the operators and the RFC, which holds a heavy mortgage on the plant, it is considered very doubtful that such an expansion can be expected. This company does have under construction a narrow strip cold-rolling mill at Fontana, which will produce approximately 20,000 tons of 18 in. strip per year; and a new Fretz-Moon buttweld pipe mill which will have a capacity of approximately 125,000 tons annually of pipe up to 4 in. diam. This plant is also revising its equipment for the cold finishing of bars produced in the merchant mill. These new facilities are expected to be in production by the third quarter of 1947.

The $25 million expansion program of Columbia Steel at Pittsburg, Calif., will result in cold reduction facilities for between 325,000 and 500,000 tons of all types of sheet and tinplate products per year. However, the introduction of this cold-finishing equipment means the elimination of the present hot sheet mills which have been producing approximately 80,000 tons of sheet and tinplate per year. Therefore the total net gain of sheet production on the Pacific Coast will be the difference between the production at Pittsburg being eliminated and the amount shipped in from other U. S. Steel Corp. plants for cold rolling there.

Bethlehem Pacific Coast Steel Corp. is planning new furnaces which will approximately double its capacity to a total of about 8000 tons per month at the Los Angeles plant. Soaking pits to supply the new blooming mill are already under construction at that plant and new rolling facilities, including a 30 in. billet mill and bar mill are contemplated. A new wire mill is in prospect at the southern plant. This company is also expanding its nut and bolt facilities at Seattle and one new bay has been erected and machinery is being installed. This expansion will involve an expenditure of approximately $500,000. In San Francisco, Bethlehem is constructing a new building to house its spectographic laboratory which will be completed in 1947.

Independent producers of steel in the West, such as Judson Steel Corp., Pacific States Steel Co., Northwest Steel Rolling Mills, and Oregon Steel Mills have not announced expansion programs but all of these companies are looking forward to continued capacity operations. It has been announced by the U. S. Steel Corp. that it expects to install a continuous strip mill

TABLE I

West Coast Employment Trends
(Source: U. S. Dept. of Labor)

	CALIFORNIA			OREGON			WASHINGTON		
	April 1940	Sept. 1943 (War Peak)	Nov. 1946	April 1940	June 1943 (War Peak)	Nov. 1946	April 1940	July 1944 (War Peak)	Nov. 1946
Total Civilian Labor Force Exclusive of Agriculture (Includes Nonmanufacturing)	2,637,000	3,403,000	3,545,000	380,000	512,000	483,000	623,600	870,300	778,700
Total Employment Exclusive of Agricultural	2,214,000	3,343,000	3,230,000	316,400	503,000	448,000	514,800	849,700	715,70
Total Manufacturing Employment	416,000	1,191,000	710,000	81,600	212,000	124,000	127,000	349,400	180,600
Total Nonmanufacturing Employment	1,798,000	2,152,000	2,520,000	234,800	291,000	324,000	387,800	500,300	535,100
Total Unemployed	423,000	60,000	315,000	63,600	9,000	35,000	108,800	20,600	63,000

at its recently acquired Geneva plant as quickly as material and machinery can be made available and that engineering is in progress. If that becomes a reality it seems very doubtful whether the Kaiser Co. could afford to make the necessary investments for a mill at Fontana which could be operated at an economically high production rate. It is believed that the proposed Geneva mill alone could satisfy the major part of the sheet and tinplate demand in the West, estimated at from 600,000 to 900,000 tons per yr. Of course, if a sheet mill could be put into operation at Fontana before Geneva got rolling, the situation might be reversed.

Two Pacific Coast neophytes in the steel producing business, disgusted with their inability to get enough sheets to meet the increased demand for their household appliances, have announced intentions of building their own rolling mills. O'Keefe & Merritt Co., Los Angeles, reports planning a 50,000-ton sheet mill and the Seidelhuber Iron & Bronze Works, Seattle, has had plans prepared for a plant of similar capacity. These ventures were announced in May and June, but no construction has begun.

Among the principal products which have benefited by the increased steel production in the West are automobile components, such as bumpers, springs and wheels; agricultural implements; home appliances, such as refrigerators, Deep Freeze boxes, gas and oil furnaces; steel furniture, bed springs, cutlery; metal doors and windows; marine construction, oil field and mining machinery and equipment.

Second to the availability of supply, steel users of the West are hopeful for more favorable basing point differentials. There is a general belief that if the Geneva Steel Co. is granted an $8.00 freight rate on finished steel from its Utah plant to the Pacific Coast, there may be some slight reduction in delivered prices for steel sheets and other products of that plant. However, any such reduction would be negligible unless base prices as recently established at Geneva are not considered as harbingers of others to come. Competent observers are of the opinion that the western area will not get its long-sought "cheaper steel" for some time.

Since VJ-Day national and western firms have expressed increasing interest in the development of new manufacturing and processing plants or expansions to serve the rapidly growing western market in both consumer and durable products. A report of the California State Chamber of Commerce indicates that for the 21 months between January 1945 and September 1946 more than 1663 new manufacturing plants were established or announced in the industrial areas of California. Of this total number, 1260 were reported as representing an investment of $188,439,523. More

TABLE III

Western Steel Ingot Capacity in Thousands of Net Tons, 1938 and 1945, by Ownership and Location*

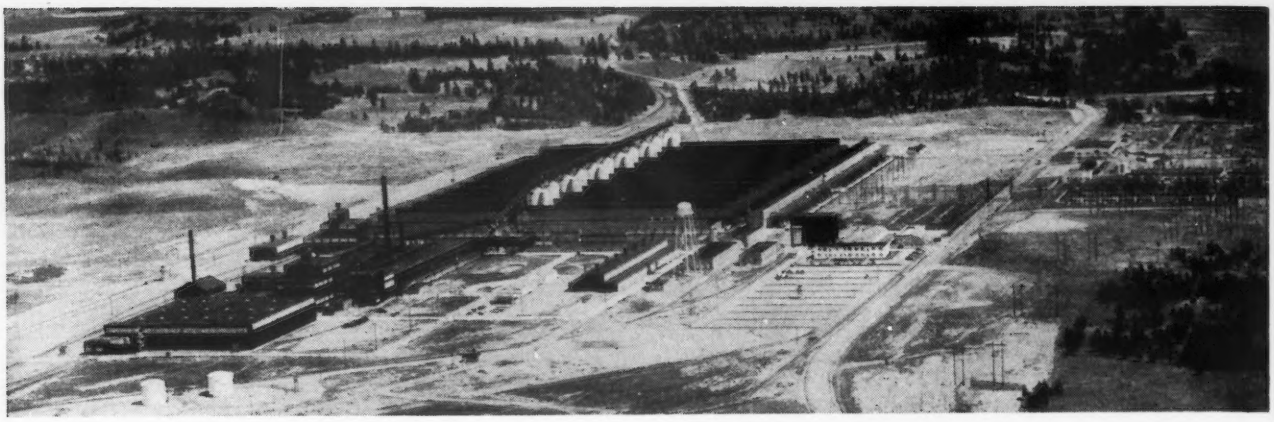
Plant	Los Angeles		San Francisco		Seattle-Portland		Utah		Colorado		Total	
	1939	1945	1939	1945	1938	1945	1939	1945	1939	1945	1938	1945
Columbia Steel	204	211	290	417[c]	....	....	....	....	....	....	494	628
Bethlehem Pacific[a]	95	117	174	235	157	210	....	....	....	....	426	562
Colorado Fuel & Iron	....	....	....	....	....	....	....	....	995	1,272	995	1,272
Kaiser Co.	....	750	....	....	....	....	....	....	....	....	....	750
Geneva	....	....	....	....	....	....	....	1,283	....	....	....	1,283
Other Companies[b]	....	....	86	165	17	92	....	....	....	....	103	257
Total	299	1,078	550	817	174	302	....	1,283	995	1,272	2,018	4,752

* 1938 figures are approximate and are from "Steel and Steel Using Industries of California," by E. T. Grether. The 1945 figures are from the American Iron & Steel Institute for January 1, 1945. Figures exclude capacity of casting and forging shops, but include total capacity of companies with rolling mills, even though minor amounts of such capacity may be assigned to castings. The large casting and forging companies in 1945 include Isaacson Iron Works (104,000 tons), National Supply Co. (46,000 tons), Pacific Car & Foundry (36,000 tons). None of these are included in the above table. There are also a number of smaller casting shops with electric furnace capacity which have also been excluded.

[a] Until the end of the war, this company was a division of the Bethlehem Steel Co. It has since been organized as a separate subsidiary with the name Bethlehem Pacific Coast Steel Corp.

[b] Includes only furnace capacity of plants with rolling mills. See note * above. For 1938 these data include Judson and Northwest Steel Rolling Mills; for 1945 it includes these two and also Pacific States Steel and Oregon Steel Mills.

[c] Includes 30,000 tons of government-owned capacity.



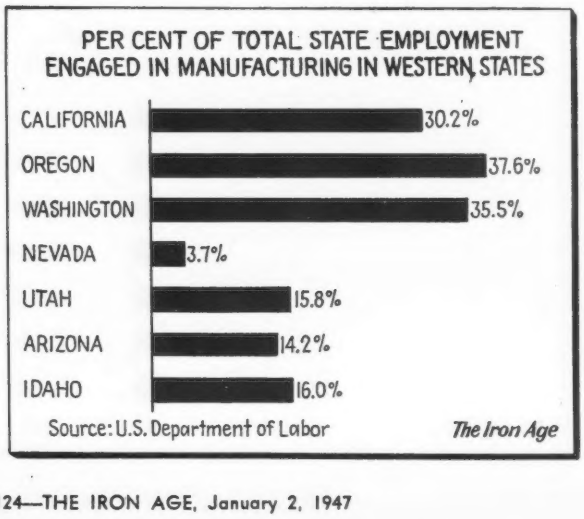
TWO important contributors to the industrialization of the West wood aluminum rolling mills (right). Both plants are

than $100 million of this amount was invested during the first 9 months of 1946. Even more striking than the establishment of completely new plants was the expansion of existing establishments during the 21-month period. There were 1292 projects of this kind during that period, representing an investment of $226,366,735 in the areas of Los Angeles and San Francisco alone. Other expansions in California totalled 105 with an investment of almost $7 million.

Of the new plants established in California during the 21-month period, 161 were involved in the production of iron and steel products and included many fabricating plants. Allied machinery manufacturing plants totalled 149 and 83 were new electrical and machinery equipment plants.

The Los Angeles area is one of the most rapidly growing sections of the West. Between Aug. 1, 1945, and Nov. 1, 1946, there have been 340 new plants established or announced as locating in the county, representing an investment of more than $90 million and an employment potential of 25,500 workers. In the same period there were 472 expansions of facilities which represented an investment of approximately $90 million and which will provide jobs for an additional 15,600 workers. The total investment in new plants and plant expansions in Los Angeles County alone since VJ-Day has reached a total equal to approximately 50 pct of the total investment by both government and private capital during the war period.

FIG. 1—Per cent of total state non-agricultural employment engaged in manufacturing in the West in 1945.



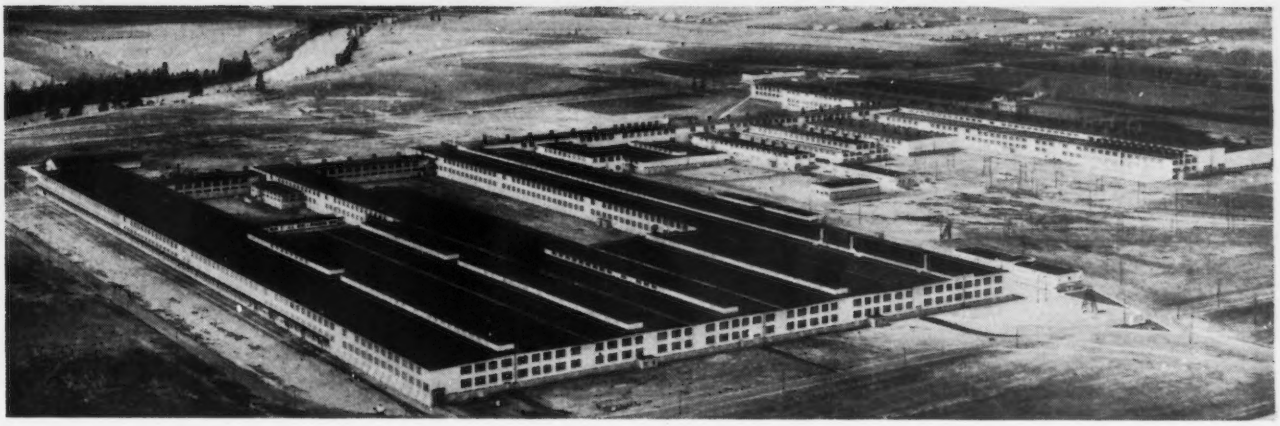
It is interesting to note that war-built plants in Los Angeles County have brought the highest rate of return on investment in the major industrial areas of the nation to the government, according to the WAA. Only one of the plants in the area offered for sale has failed to elicit the interest of bidders. This is the aluminum reduction plant which is stymied because of a reported lack of power. The shipyards have dwindled in activity to practically nothing, but former employees have apparently been taken up by the new plants, such as those which are now producing 31 basic materials never before manufactured in the county.

Ranking second only to Detroit in automobile assembly, Los Angeles now has plants either at work or under construction to assemble 14 different makes of automobiles. This total will equal the number of different makes of passenger cars assembled in Detroit. Annual production in Los Angeles calls for 650,000 cars as compared to a prewar high of 150,000 units. Holding first place nationally in production of aircraft, Los Angeles manufacturers report a backlog of approximately $600 million and employment of 65,000 workers as compared to 53,000 in the prewar era. The oil tool and oil well equipment industry continues to hold first place nationally, and there is considerable interest and prospect in the export field for increased volume. Other industries in which the Los Angeles County area ranks high are apparel, motion pictures, furniture, rubber, petroleum refining and food processing.

San Francisco Area Expansion

The 12-county area surrounding San Francisco Bay, which is the second most important industrial area of the state, boasts of 539 expansions and 673 new plants in the 14 months between September 1945 and October 1946, representing an investment of $159,238,000. Twelve per cent of the 4501 factories in operation in the 12-county area in 1939 were expanded during this 14-month period. Approximately 85 pct of the development in northern California has taken place in this 12-county bay area.

Total manufacturing employment in the San Francisco-Oakland bay area was recorded in May 1946 as 189,800 and at that time it was anticipated that employment in November 1946 would be 186,000. A projection made into January 1947 indicated a further drop to a total of 175,000 employed. This decline is recognizable as attributable largely to seasonal activities in some of the manufacturing fields.



Coast: The Mead aluminum reduction plant (left) and the Trent- being operated by Permanente Metals Corp., Spokane

The Pacific Northwest benefited by the general wartime expansion of industrial activity and contrary to some expectations VJ-Day did not mark the beginning of serious retrogression. The city of Portland, which is the most active industrial area of the state of Oregon, had a wartime increase in population of approximately 100,000, which brought the total up to about 403,000 in June of 1944. The metropolitan area surrounding the city, which includes Vancouver, Wash. and parts of Multnomah County outside the city limits, increased almost a quarter of a million people in that same period.

Oregon Steel Mills, which began operation during the war as did the Electro-Metallurgical Co. and the Pacific Carbide Co., are continuing, and the aluminum reduction plant at Troutdale has been leased to the Reynolds Metals Co. for capacity operation. There is still considerable interest over the possibility of Kaiser converting its Portland Swan Island yards for the production of industrial equipment or possibly buses and household appliances. Availability of abundant electric power from the Bonneville Power Administration at a base rate of $17.50 per kw-yr has been an important factor in stimulating industry.

Seattle Holds Gains

The decline in manufacturing employment for the state of Washington to 192,900 in August 1946, well below the peak of 349,400, is not completely accurate in reflecting the employment situation in that area. There has been a considerable return of workers to the mines and lumbering and fishing industries which have long been the backbone of the economy of this state. Curtailment of some of the expanded industries has occurred, but on the whole reconversion itself was no problem and the transition in industry consisted largely of a reduction in the production volume of established products. In Seattle the transportation equipment industry, including ship work, in May 1946 accounted for more than 55 pct of the employment in manufacturing and was expected to decline approximately 18 pct by January 1947. Other manufacturing industries are expected to show gains in employment averaging 10 pct during the first quarter of 1947. Puget Sound Navy Yard, which had a peak employment of 32,600 will have a cut back to 8000 by the first of January 1947. It had 3400 employees in 1938.

In eastern Washington industrialization has been given a tremendous boost by the reopening of two war-born aluminum plants—the Mead reduction works and the Trentwood rolling mill—now in operation by Permanente Metals Corp. near Spokane. With this impetus and the proximity of Grand Coulee Dam with its tremendous power supply, a number of new, small but important, industrial plants have been developed in this inland empire.

In the sparse rural state of Utah stands the Geneva steel plant, now operated as a subsidiary of the U. S. Steel Corp., and recognized as one of the strongest pillars of industrialization of the West. While the construction of this giant plant was at one time opposed by Utahans, it is now looked upon as the state's most important industrial source of employment and wealth. Ingot production is rapidly increasing to well over the 50 pct mark and the structural and plate mills have been operating on one and two turns. Employment is slightly more than 3000.

The only serious consideration involved in the future of this plant seems to be whether the railroads will allow a requested $8 per ton freight rate from Geneva to Pacific Coast points. It is generally conceded that without this reduction from the present $12 rate the plant cannot play its expected role in the industries of the Intermountain area or on the West Coast.

It is expected that the availability of raw and semi-finished steel in this area will encourage the establishment of satellite industries such as that of the Besser Mfg. Co. which recently set up a plant to make concrete block machinery at Salt Lake City. Several other industrial companies have been investigating possibilities for production facilities in the immediate vicinity of the steel plant.

Arizona, long noted for its sunshine and agricultural production, is becoming an increasingly important factor in manufacturing although the total employment and production at this time is relatively small. It was estimated by the USES that fourth quarter 1946 manufacturing activity would show an increase of approximately 20 pct, and that there would be an increase of more than 30 pct in the first quarter of 1947 compared with the level reached in the second quarter of 1946. The principal gain was expected to be brought about with the operation of the aluminum extrusion plant at Phoenix by the Reynolds Metals Co. It has been anticipated that by January 1947, 1000 persons would be added to the manufacturing payroll through the operation of this one plant.

Increased activity is expected in this area in radio production, manufacture of aluminum window frames, and improvement in the lumber, furniture and fabricated iron and steel industries.

ORE AND COAL

The iron ore and bituminous coal industries found in 1946 a short, unhappy year. Beset with more than their share of labor troubles and cost increases, both industries saw in their future many technological question marks. Ore companies, looking to the future, have intensified beneficiation studies to permit wider use of low grade material and are aggressively investigating several new foreign ore sources. Coal mine operators, seeing in continuity of operations the salvation of some of the industry's economic problems, are wistfully hoping that 1947 will see a settlement of its labor problems.

By W. A. LLOYD
Cleveland Regional Editor
THE IRON AGE

REQUISITE to war and peace, iron ore has lately achieved a panegyric prominence which is in raucous contrast to the almost severe dignity of the iron ore companies whose silence has long belied the importance of their function. Cause of this opinionated, vocal and journalistic furor is this unhappy, salient fact, that the rock ribs of the mighty Mesabi are beginning to show and not since Oliver Iron Mining Co. announced its entry into the market as a seller has iron ore been so big a topic in the industrial times. But the question today is one of reserves, and not the "inflexible" iron ore price.

The problem of reserves was brought into sharp focus in the early part of World War II when it became apparent that the drain of war requirements upon the Mesabi would be serious. Accordingly, E. W. Davis, director of the mines experiment station of the University of Minnesota, made a report to the materials division of the War Production Board in 1942. Prof. Davis' splendid document brought beneficiation of low grade ores and foreign ore deposits into the pale of immediate consideration.

Reserves of the entire Lake Superior district have been something of an enigma to the public for a long time, and particularly since the end of World War II. Prof. Davis' report stated that at war production rates (an estimated 100 million tons a year) the district's known ore reserves would be exhausted by 1950, and without government financing for beneficiation plants, a shortage of ore could be expected for several years prior to complete exhaustion. But while the war ended sooner than was foreseen in 1942, and while Lake Superior district yearly shipments never reached 100 million tons, the specter of a depleted Mesabi danced in the corridor of the public mind, jeopardizing the future of the steel industry, it seemed.

Out of the projected iron ore holocaust, beneficiation, foreign deposits, and depletion of the Mesabi emerged as popular and perennial fodder for virtually all echelons of the working press and misunderstanding probably mounted accordingly. It is hoped, however, that the wealth of editorial treatment may end the excessive inaccessibility of some of the iron ore companies and that their progress toward feasible beneficiation, which has been a serious and orderly procedure since the early 30s, will be removed from the blanket of secrecy that has surrounded it.

On the matter of the Mesabi's reserves, the recent work of John W. Gruner, professor of geology and mineralogy at the University of Minnesota, is particularly refreshing. In his volume, "Mineralogy and Geology of the Mesabi Range," Prof. Gruner states that there is probably no other ore district in the world reserves of which are better known than the Mesabi.

"The deposits are flat and large in area. Drilling easily discovers them if it is properly placed. There are still undiscovered high grade ore bodies, but they are few and relatively small, perhaps of the order of 100,000 to 1,000,000 tons each. Much larger reserves of undiscovered (that is, undrilled) ore belong to ore bodies already known but incompletely developed. Since ad valorem taxes on ore in the ground are high, there has been no incentive for a fee owner to develop a deposit in great detail until he is practically ready to mine the ore."

Minnesota's Tax Commission, Prof. Gruner points out, has published figures on ore reserves since about 1915 based on ore estimates submitted by fee owners and operators who are compelled by law to supply such data. If one plots these figures and compares them with the tonnages of ore mined each year, as in fig. 1, it is apparent that ore reserves have declined only one-third as rapidly as would have been expected on the basis of reserves in 1915. In other words, while almost 1000 million tons were shipped, the reserves decreased only about 300 million tons.

Reasons for this apparent discrepancy, Prof. Gruner notes, are the discovery of new ore, particularly in the detailed development of already known large bodies; reclassification as ore of material formerly believed not minable because of some changes in blast furnace practice, for example, much ore high in Al_2O_3, formerly thought unsuitable, can now be used in large amounts; and, all around advances in beneficiation, particularly in washing, which opened vast reserves on the West Mesabi range formerly not classified as ore. Such reserves are figured in the ore estimates on the basis of tons of concentrates extractable from them and not on actual tons in the ground.

"It would be a mistake," Prof. Gruner believes, 'to assume that the trend of the two curves in fig. 1 could be maintained for many years; that each year the decrease would be 20 million tons less than expected on the basis of the ore mined. During the war years (1940-1945), greater inroads have been made, particularly on the ore reserves minable by open pit, than in any previous 10-yr period.

"The Mesabi range is the only district in North America that could double its output at a moment's notice, and, therefore, its reserves of high grade ore have decreased at an alarming rate during the war. The remaining reserves with their classifications according to the Minnesota Tax Commission are shown in table I.

"Such tonnages," Prof. Gruner estimates, "should last several decades at a normal rate of perhaps 35 million tons shipped a year. Underground ores will outlast the open pit ores, as they will not be mined at a pace very much accelerated from the present pace, about 3 million tons a year, until a marked shortage in open pit ore develops. Production from underground mines may be expected to rise to pos-

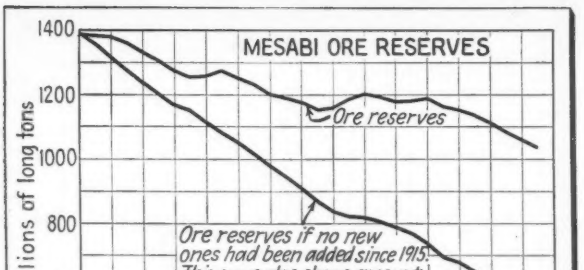


FIG. 1—Mesabi range ore reserves, showing effect of discovery of new bodies, advances in beneficiating, etc. This chart is presented through courtesy of J. W. Gruner, professor of geology and mineralogy, University of Minnesota.

sibly 7 or 8 million tons as open pit mining declines. Some of the ore classified as underground may perhaps be mined by open pit if the mining methods improve in the future as they have in the last 10 yr."

Prof. Gruner has estimated that about 150 million tons of direct shipping ore, partly open pit, partly underground, have not yet been discovered which may be expected to be largely in the extensions of large bodies already known in their general outlines. A similar tonnage of concentrates probably can also be expected to be produced from wash ores which have not yet been developed and listed as reserves.

The normal life of the Mesabi range, he concludes, may be expected to be three or four decades longer, after which there will be a gradual decline over a period of 30 or 40 yr. The marginal oxidized low grade ores should not change this expected course of events materially, as they are very erratic in occurrence, grade and minable tonnage. If the magnetic taconites can be mined profitably and gradually take the place of the hematite ores, a very much longer life may be predicted for the iron ore industry of the range.

Much experimental work has been done with the oxidized low grade ores, and it is known that magnetic roasting, gravity separation and flotation will produce usable concentrates. So far, however, the cost of such treatments has been prohibitive except in cases where the low grade material had to be removed and handled anyway to mine higher grade ores.

The textures and structures of these ores, Prof. Gruner notes, are more like those of the taconite than those of the high grade ores. Leaching has been insufficient to produce slumping in them except where they are interstratified with regular ores. For the most part they are hard and need crushing, but since they are not tough like fresh taconite, the cost of this operation is lower.

One of the problems is to separate the massive oxide layers from the leaner material. Jigging has been successfully employed for this operation in a few instances. There is, however, so much material which is cemented so firmly that this method cannot be used. This material will need to be crushed to fine sizes if flotation is the method to be used to free it from silica. Crushing to minus 100 mesh and finer may be required. Practically no data have been published on the behavior of such low grade ores in flotation.

According to Prof. Gruner, magnetic roasting has been tried on this low grade ore with varying success, with the object of converting the nonmagnetic oxides in a reducing atmosphere to magnetic material. This may be done before the ore is crushed in fine sizes. If the crushed particles range too widely in size and porosity, the iron oxides will be reduced by the roast to varying degrees. Before magnetic separation is attempted the reduced material has to be crushed to its optimum grain size for concentration. The finely divided concentrates are sintered or agglomerated before shipping.

"While no figures have been published on the cost of this treatment, it will be realized that they must be high, probably in the neighborhood of $2.00 per ton of concentrates for roasting, magnetic separation and sintering," Prof. Gruner stated.

No estimate of reserves of oxidized low grade ores can be made on the manner in which it was done for high grade material. It may be assumed that all high grade ore in the ground is surrounded by oxidized and partially leached taconite. Also, most of the horse and rock islands seen in the open pits consist of such material, but it would be wrong to conclude from this observation that all such oxidized taconite could be mined and beneficiated at a profit in the future. As with the magnetic taconite, only certain Cherty subdivisions of the formation will yield usable concentrates.

There may be seen on the Mesabi range many stockpiles of so-called low grade ore which are accumulations of rocky material which had to be removed to mine the high grade ore. Prof. Gruner estimates that about 100 million tons of such low grade ore already in stockpiles are easily available for future beneficiation. Under favorable conditions they should yield about 40 million tons of concentrates.

Despite these reserves, however, and the southern ores which cannot be mined at the speed nor have the quality to supply more of the national proportion than they have, reserves of which according to some experts are as much as or a little more than the Lake Superior reserves; and the northeastern states, particularly New York, where there are large reserves of high grade concentrates, but which will

TABLE I

Classification of Iron Ore Reserves of Mesabi Range*
(As of May 1, 1944)

Classification	Mesabi Range, Tons
Direct Ore:	
Open Pit	515,852,000
Underground	349,187,000
Total	865,039,000
Concentrates:	
Open Pit	110,076,000
Underground	57,858,000
Total	167,934,000
Total Ore:	
In Ground	1,032,973,000
In Stock-pile	11,863,000
Total	1,044,836,000

* From Mining Directory of Minnesota, 1945, Mines Experiment Station, University of Minnesota.

probably not yield more than 7 or 8 million tons a year, the battle of beneficiation and the iron ore rush for foreign deposits were both well under way in 1946.

Beneficiating in the Superior District

While it is not entirely an indication of the iron ore industry's foresight, the beneficiation of iron ores in the Lake Superior district has been under way on a commercial scale for about 40 yr. Oliver Iron Mining Co.'s Trout Lake concentrator washed its first ore in 1910 and is still the largest plant of its kind in the Lake Superior district. In 1924, jigging was started, although jigging of iron ore to remove coarse gage material got under way in 1910. Since 1937 the sink and float process has been used in the production of iron ore, using heavy fluids. The flotation process has been conducted on the Mesabi range iron ore on a laboratory scale for a number of years. Sintering at a large plant on the Cuyuna Range at Crosby, Minn., is the only place where sintering of iron ore at iron mines is under way on the ranges. A large and successful plant is in operation on the Michipicoten range in Ontario.

Since 1942, some work has been done with hydrosizers, double classification and flotation, and almost all of the research and introduction of new machines and processes has been to the end of recovering more of the iron oxide. The methods used in concentration up to the present time have all been simply gravity methods.

Prof. Davis pointed out to the AISE some months ago that Bethlehem Steel Co. and Youngstown Sheet & Tube Co., through Pickands Mather & Co., have acquired large areas of taconite on the Mesabi and have a laboratory and test plant operating near Hibbing, Minn., concentrating large samples from the properties they have acquired.

This work has been going on for the past 5 yr and obviously these companies feel that the expenditures they are making are justified. Oglebay, Norton Co. is doing the same type of work in cooperation with American Rolling Mill Co. and Wheeling Steel Corp.

About two years ago, ten companies sponsored a research project at the Battelle Memorial Institute, Columbus, Ohio, which has for its objective the development of a concentrating process which may be successfully applied to the Mesabi formation material, in which the iron occurs primarily in the form of nonmagnetic iron oxides.

The iron in the taconite occurs so finely distributed that it is necessary to grind the rock finer than 150 mesh to give mineral liberation. Two general processes are under investigation at Battelle: First, grinding the taconite fine enough to give mineral liberation and then separating the iron minerals from the waste minerals by means of froth flotation; The second method consists of crushing the rock to about 0.5 in. and heating it in a furnace in the presence of a reducing agent such as coal or coke, which converts the iron minerals to a magnetic form. The roasted rock is then ground fine enough to give mineral liberation and the iron is separated from the impurities by means of a magnet. Much research remains to be done before a commercial, economic process for the treatment of taconite is assured.

Walter L. Maxson, director of research, Oliver Iron Mining Co., in a paper presented before the AIME Blast Furnace and Raw Materials Conference, has pointed out that blast furnace operators may well project their thinking to those conditions which must be faced when the proportion of fine structure concentrates in agglomerated form constitutes a large part of the ore burden to the end that practices will be prepared to anticipate the changes in an orderly manner.

According to George W. Hewitt, assistant vice president in charge of operations, Wheeling Steel Corp., beneficiation in the 1941-45 period was about

FIG. 2 — Members of Hanna exploration party at foot of 70-ft ore exposure in Brazil.

double what it was in 1936-1940. About 22 pct of total ore that is now being beneficiated on the Mesabi, with about twice that proportion on the Cuyuna and the other ranges, are not of consequence. In 1941, 28 concentration plants were in operation in the Lake Superior district, all of them in Minnesota, many of them built to serve properties containing nothing but low grade ores. But of the 28 plants, only three produced over 1 million tons.

Recommending a planned program based on an increasing tonnage of concentrates from the low grade ores, Mr. Hewitt pointed out that taconite concentration will require large individual plants and heavy initial capital investment amounting to possibly $15 or $20 per ton of yearly production.

"And there is still the big problem, if a concentration plant starts to operate and for some years must be in a competitive position with low cost open pit mining, that the strain will be heavy for that period on investors, even though it is only a question of time until the growing scarcity of the open pit ore will radically change the picture."

Much secrecy surrounds the flotation process, in which the ore is ground to a powder, immersed in water, and a chemical reagent added, which, depending upon the type employed, brings either the waste product or the ore to the surface, where it is removed. Probably the main reason that flotation is in the hush-hush category in the iron ore industry is that Minerals Separation Co. some time ago took out a number of patents on the flotation processes used for copper and phosphates, and has collected royalties on the use of them.

Thus it is that the industry's progress toward a cheaper reagent for the flotation process, which will make the process feasible commercially, is not known. Iron ore men are talking about beneficiating ore on a large scale, within five or ten years. Confident that they can do it, talk of minus 150 mesh raises no eyebrows around the iron ore companies.

But benefication's rule of thumb, three tons of taconite to produce one ton of concentrate, is a cornerstone in the argument put forth by beneficiation's skeptics, that higher labor costs will bring in foreign ores.

Foreign Ore Properties

Spearheading the drive on foreign iron ore properties during 1946 was M. A. Hanna Co., Cleveland. In February, George M. Humphrey, Hanna's president, reported that the exploration his company had been conducting for several years in association with the Hollinger Consolidated Gold Mine interests in Labrador and Quebec was continuing to develop favorably.

"We have discovered large surface showings of very high grade iron ore which we now propose to drill extensively. A preliminary survey of the necessary railway (cost, $70 million) has been completed and there are interesting possibilities for the development of important iron ore deposits," Mr. Humphrey said.

Three months later, it was revealed that Hanna Co. has plans for exploring hitherto undeveloped deposits of high grade iron ore outcrops in the Brazilian territory of Amapa, north of the Amazon River. M. A. Hanna Co. interests were granted an option for a long time lease (50 yr) to mine the Amapa ore and to build a 75-mile railroad from the ore deposits to the city of Macapa, capital of Amapa, on the northernmost mouth of the Amazon. The contract, granted by Capt. Janary Gentil Nunes, Governor of Amapa, was negotiated by H. L. Pierce, Hanna company executive. Members of a Hanna exploration party in Brazil are shown in fig. 2. at the foot of a 70-ft ore exposure.

The Amapa ore deposits, which may contain extremely large tonnages of high quality ore recoverable by open pit mining, lie in the district of Santa Maria and can be delivered to deep water with a relatively short haul.

Reports of large reserves of high grade iron ore in Labrador had tongues wagging in April, 1945, when Dr. J. A. Retty, chief geologist of the Labrador Mining & Exploration Co., Ltd., told members of the Canadian Institute of Mining and Metallurgy that the Sawyer Lake deposit in central Labrador had been probed by diamond drilling in exploratory holes to a depth of 220 ft with the drill still in ore. Analyses of ore samples yielded an average of 68.4 pct iron with phosphorus sulfur and silica contents very low. Open at both ends, the tonnage of this high grade lump quality premium ore was indicated by the work done at that time to yield a minimum of 30,000 tons of ore per vertical foot to an indicated minimum tonnage of approximately 6 million tons.

Last year was the first year for drilling, and since the deposits are 350 miles from water, almost everything has to be flown in. Typical of a first year operation, almost everything happened. However, Hanna officials, including Mr. Pierce, are just as optimistic about the Labrador deposits as ever. It has been emphasized, however, that the potential tonnage will have to be big to warrant a railroad of that length. Present knowledge of the Labrador deposits indicates that it will be another year or two before developments warrant a railroad. The deposits contain a high grade iron ore, which will ship about 60 pct natural iron and about 68 pct dry.

While there are many factors incompletely evaluated as yet, the Hanna experts feel it will be five years at least before the Labrador deposits get under way to a satisfactory extent.

The Hanna Co. estimates that a much larger tonnage is potentially available in Labrador than in Brazil. In fact, the present ratio of the potential ore in each is in Labrador's favor as a district is to a mine. Output of the Brazilian deposits might be 500,000 to 1,000,000 tons a year; Labrador's from 5,000 to 10,000,000 tons a year. Also in Labrador's favor is the possibility that ore could be floated up the St. Lawrence, but the boats would have to be smaller than the present ore carriers.

Despite the interest shown in foreign ore deposits in 1946, Bethlehem Steel Co., old line leader in foreign ore fields, continued to be the only major steel producer to import iron ore. While Bethlehem is using ore from Chile at Sparrows Point, the company also has a finger on deposits in Las Truchas, Mexico; Firmeza, Cuba; El Pao, Venezuela; Romeral and El Tofo, Chile.

Possibility of still another new source of high grade iron ore this time at the head of Lake Huron, was expedited to some extent by the Westland Mining Co. Capital for the venture was obtained in March and samples taken from the deposits and assayed by the Provincial Department of Mines show the hematite ore is considerably above 60 pct iron, or about 20 pct higher than the average of the ores being mined in the Lake Superior district.

In April, Republic Steel Corp. started guessers

guessing with the announcement that they had acquired extensive iron ore properties in Mexico which could be used to advantage by its southern plants, Gulfsteel at Gadsden, Ala., and Thomas at Birmingham. T. M. Girdler, chairman, and C. M. White, president, stated that with the exhaustion of free shipping ore in the Lake Superior region now confronting the industry, Republic had some years ago entered the northern New York iron ore field and developed mines which are producing about 1 million tons of ore annually.

Jones & Laughlin Steel Corp. and M. A. Hanna Co. are also interested in New York ore. Much of this ore must be mined underground, but it has the advantage of lower freight costs to the Pittsburgh and Youngstown districts, which together consume about 40 pct of the Lake Superior district iron ore. As for Steep Rock, (see fig. 3), Cyrus Eaton has said, "The great Mesabi range is fast exhausting its rich ores—taconite and other lean ores will eventually, through large capital investment, have to fill the gap. In the meantime, the discovery and development of a new range, containing untold quantities of the highest grade ore, in the Steep Rock, Ontario, area, is a timely and fortunate aid to the steel industry of the Great Lakes region. Steep Rock closed the season with a total of 993,798 tons of ore shipped and stockpiled in 1946. Next year Steep Rock proposes to ship 1,250,000 tons. This is only the beginning."

Steep Rock shipped 16,552 gross tons in 1944, its first year, and 505,375 gross tons in 1945. About 370 men are employed at the present time, working three shifts in the mine and two shifts in the crushing plant, which is reached by a railway spur 3½ miles long.

According to some of the experts, 1946 was a difficult season for the Lake Superior district. While shipments reached 59,417,000 tons, a month was lost at the start of the season because of the CIO strike, which began Feb. 8 and ended variously from May 15 to May 27, depending on the company. Adding to the unpleasantness was the Canadian steel strike. Carriers of U. S. registry took care of Algoma Steel Corp., which continued to operate its furnaces, because it was not permissible to unload Canadian boats.

One of the unhappy yet triumphant chapters was the lake shipping strike which was called at 12.01 a.m. Aug. 15 by the CIO-National Maritime Union. Throughout the strike, which was about 10 pct effective, the fleet continued to deliver iron ore at lower lake ports, and when all but the last, lone, strike-bound vessel had regained crews and sailed Sept. 4, the Lake Superior Iron Ore Assn. was able to report that 9,539,547 gross tons of ore had been delivered to U. S. ports on the Great Lakes during August. By comparison, 10,634,896 gross tons were brought down during the preceding strike-free month of July.

Over 90 pct of the volume moved annually on the lakes is carried in the 316 vessels owned by the 53 companies making up the Lake Carriers Assn. The strength of this fleet, which includes 27 vessels for which NMU has bargaining rights, ebbed slowly after the strike call to a low point of 85.5 pct with 46 vessels laid by on the sixth day. Thereafter, crews began putting the strike-bound fraction of the fleet back into normal operation.

The Lake Carriers fleet had gained back to nearly 90 pct of its full strength when, on Aug. 23, Standard Oil of Indiana, not a member of LCA, signed up its five tankers on compromise terms, calling for a base pay week of 48 hr at sea and 44 hr in port, similar to NMU's salt water contracts.

Shortly thereafter, Bethlehem Steel Co., with 12 vessels, signed on the same terms. Still in the throes of renegotiating contracts for some of the vessels with which it previously held bargaining rights, NMU issued a cease-fire order on its strike for noon, Aug. 30. The Lake Carriers Assn. then announced that the minimum wage scale recommended by the association would be adjusted to whatever difference the new pay week might effect. NMU had won the issue, but lost the strike.

FIG. 3—Steep rock ore deposits in Ontario, shown here, shipped and stocked 993,798 tons of ore in 1946. Shipments in 1947 are expected to reach 1,250,000 tons.

Coal in 1946

The short, unhappy history of the coal industry in 1946, admittedly a rough and tumble year, might readily be written on a single page. On April 1, at 12:01 a.m., 400,000 members of the United Mine Workers went out on strike. On May 10, the operators accepted a 2-week truce offered by John L. Lewis, who ordered his men back to work May 13. On May 21, President Truman ordered Julius Krug, Secretary of the Interior, to take over the soft coal mines. On May 22, 130,000 of the 400,000 UMW members were idle in individual protest, of their own volition, closing 2100 of 4300 soft coal mines. On May 27, the miners renewed the strike, independent of Mr. Lewis, as the 2-week truce ended. On May 29, th 59-day strike ended when the UMW signed a government contract. On June 3, miners resumed work under the government contract. On May 30, about 75,000 anthracite miners struck to get what the soft coal miners got. On June 7, that 8-day strike ended.

Gained by the 59-day strike was an 18½¢ an hour

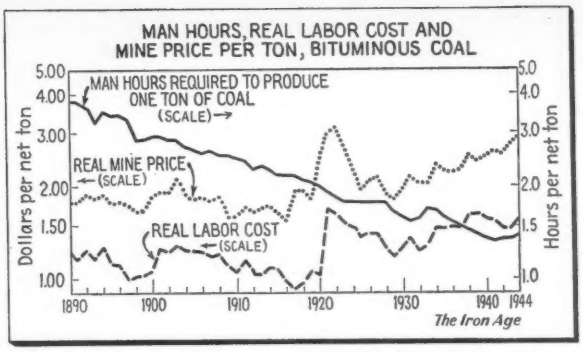


FIG. 4—Some significant trends in the bituminous coal industry are shown in these four graphs prepared by Donald R. G. Cowan & Associates, Cleveland, for the National Coal Association, Washington.

increase, or $1.85 a day, with overtime; a welfare and retirement fund financed by a tariff of 5¢ a ton on coal produced; a work week of five 9-hr days with overtime after 7 hrs; and a medical and hospital fund to be administered by the union. The hard coal miners got the same thing.

On Nov. 21, a strike was called by the UMW and the men went out in the face of a temporary injunction issued Nov. 18 requiring miners to uphold their contract. On Nov. 22, Mr. Lewis was cited for contempt. On Nov. 28, the government obtained a restraining order. On Dec. 7 the strike was settled and the miners went back to work.

The byproducts of the last strike included a rail embargo, invoked Dec. 3, and effective Dec. 6. On Dec. 4, John Lewis and the UMW were fined; $10,000 was levied on John and $3,500,000 on the UMW. Appeal was taken to the Supreme Court immediately. About 90 million tons, somewhat less than 2 months' production, was lost through strikes. Table II shows soft coal production and consumption in by-product and beehive ovens in 1946.

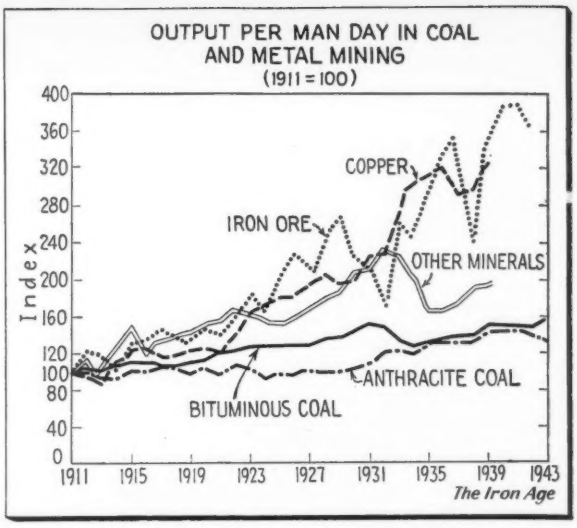
Probably the best objective summation of the coal industry and its weakening competitive position has been written by Dr. Donald R. G. Cowan, consulting economist of the National Coal Association. A graphic summary of some of Dr. Cowan's findings is given in fig. 4. According to Dr. Cowan, the present rate of output of bituminous coal in the United

TABLE II

Bituminous Coal—1946
(Thousands of Net Tons)

	Total Production	Consumption			Exports
		By-Product Coke Ovens	Beehive Coke Ovens	Steel and Rolling Mills	
January	54,075	5,299	631	552	2,813
February	49,975	3,744	570	683	3,130
March	56,540	7,101	719	815	3,633
April	3,356	5,502	38	749	1,744
May	19,790	3,654	35	546	732
June	50,350	6,309	571	582	3,245
July	51,205	7,551	716	671	5,418
August	54,450	7,781	788	760	5,875
September	51,080	7,578	729	725	.....
October	56,385*	7,814	837	828	.....
November	38,000*	.....	...	...	.....
December	36,000*	.....	...	...	.....
Total	521,206*	.....	...	...	.....
Total First 10 Mos.	.....	62,333	5,634	6,911	.....

Estimated 1946 coke production, 58,000,000 tons.
* Estimated.



States is at the peak established in 1944, when the mines produced 620 million tons.

Production in 1946, estimated by the Bituminous Coal Institute at 515 million tons, to the Nov. 21 strike was 14 pct less than the mine output in the corresponding period of 1944 and 6 pct less than the mine output in the corresponding period of 1945.

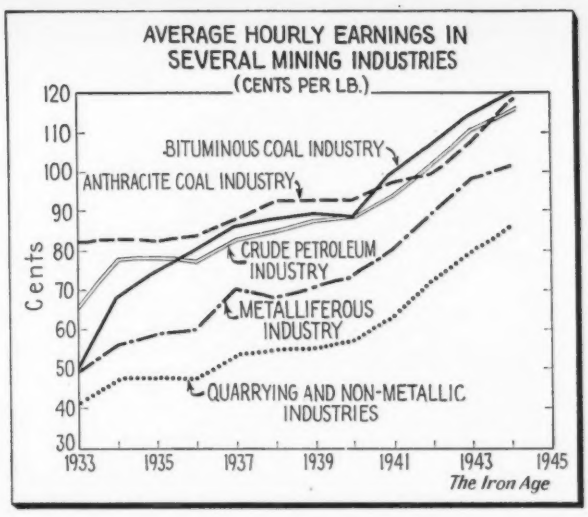
Miners received higher incomes and operations were pushed to the limit in 1946. Company earnings, although generally providing a meager return on investment and showing a tendency to decline since 1943, have been higher than in many prewar years, when annual losses were common. The present abnormally high production, Dr. Cowan states, conceals underlying economic trends of serious importance to the industry.

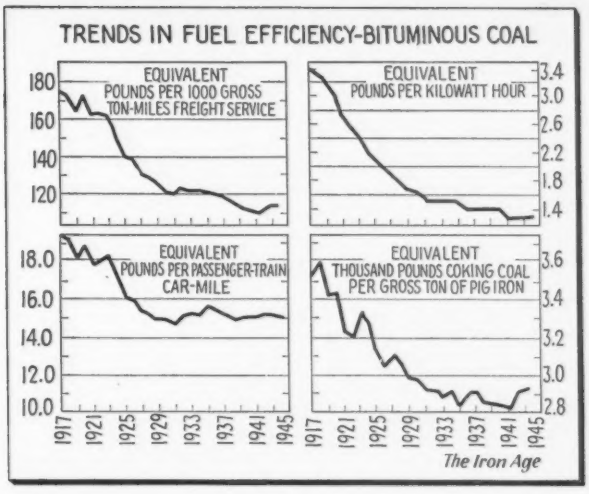
Coal is one of a large class of products for which the competition between many producers and many buyers determines the price in a free market. Combustion engineers have been learning how to spread it thinly over the work to be done and have increased the use of substitute fuels. Steel mills, railroads, electric utilities, and manufacturing industries have steadily reduced the amounts of coal required to do given units of work, such as a ton-mile or a kilowatt hour, as fig. 4 shows.

Dr. Cowan agrees that, as a conservation measure, increased combustion efficiency is commendable, but suggests that coal has been losing its advantage of economy, which in fact is exactly what has happened. "If allowance is made for changes in the general level of prices from 1890 to the present, the real (real prices of coal are those which would be realized if the general level of prices were constant) mine price of coal fell slowly, reaching its lowest level in 1916, while coal consumption, under this stimulus, increased rapidly. On the other hand, by 1945, real coal prices at mines were 89 pct higher than in 1916. and coal consumption declined until World War II in contrast with the growing use of other fuels.

"From 1930 to 1945 the real price of coal at the mines rose 48 pct, the real price of fuel oil at the refineries increased only 33 pct, and the real price of delivered natural gas fell 20 pct. In terms of their calorific values, 1945 real prices per million Btu's were 11.1¢ for coal, 43.7¢ for fuel oil and 9.7¢ for industrial natural gas."

The answer to why coal prices have risen so much while other fuels have improved their competitive





position, Dr. Cowan reveals, lies in the costs of production and distribution. Increasing use of cutting, cleaning and loading machinery has brought about a long, steady decline in the labor required to produce coal, from 3.90 manhour per ton in 1890 to 1.34 in 1939, a reduction of 66 pct.

"Although this downward tendency was arrested during the war, coal operators may take just pride in their long, sustained accomplishments in saving labor. In 1918, 615,000 men mined 579 million tons of coal, while in 1945 only 370,000 men mined 576 million tons, a reduction of 40 pct in men required to produce an equivalent tonnage."

The reduction in manual labor per ton has been more than offset by rising labor costs. The real labor cost per manhour increased by 177 pct from 1917 to 1944, offsetting the reduction in manual labor per ton. Consequently, the real labor cost per ton has increased by 75 pct. The industry as a whole has turned over to labor more than the whole of the advantage arising from mechanization. The increased costs have been reflected in rising prices, which in turn have checked and reduced coal sales.

During the past 30 years, the petroleum and natural gas industries have grown at more rapid rates than the coal industry. Output per manhour has increased more rapidly than in coal. In addition, labor cost in these industries, taken together, is down to less than one-fifth of the total value of these products, while for over 50 years labor cost in coal mining has remained at about three-fifths of the realized mine price.

According to Dr. Cowan, in 1944 the mine price of coal was $2.92 a ton and the average freight handling charge was $2.21. This charge, which has not varied appreciably in many years, was recently raised by about 3.5 pct and an additional increase went into effect Jan. 1. When coal volume expands, there is no decline in coal transportation charges per ton. Thus coal is at a competitive disadvantage because of inelastic distribution cost per ton.

Chief of the industry's immediate problems is how to attain continuity of operation when the mines are once more returned. Toward this end, a program of revised labor legislation would seem to have a nominal priority. It is significant, however, and perhaps symptomatic of a new era in operator-miner relations, that a number of important coal operators are already on record against anti-labor legislation of a punitive nature.

Perhaps more significant than the presence of Republicans in majority numbers in, around and about Capitol Hill are two of the salutary developments of 1946, the present Administration's firmness in the recent imbroglio and the operators' stand, into which John Lewis was unable to drive a successful wedge.

But the year's most intriguing enigma surrounds the visits of Cyrus Eaton, Cleveland financier and entrepreneur of many enterprises, to the White House, reportedly as the emissary of Robert R. Young, chairman of the board of the Chesapeake & Ohio Railway Co. Purpose and course of Mr. Eaton's visits are known to a very small group indeed.

Coke production, see table II, estimated at 58 million tons in 1946, was in tight supply throughout the year, and some of the experts are about ready to admit that there is not enough coke in the country to run all the blast furnaces. Many of the by-product coke ovens were built in the period 1915-1925, and with a normal expectancy of 20 yr. During World War II, they were pushed hard at a time when they were getting along in years; their normal life was already gone, and the pushing during the war shortened any considerable extension. As a result, many of those ovens cannot produce as much as they did during the war, and many of the beehives at the marginal mines couldn't go in 1946 because of prices.

Through August, production of coke was only approximately 35 million tons, and a rapid acceleration has taken place in industrial coke requirements, which far exceed production, and to meet this demand it was necessary to utilize the larger sizes of coke going to consumers. Coke was a struggle for the steel industry all the way through 1946, with shut-downs, start-ups playing hob with equipment. In 1947, prices may bring some of the beehives back in, but the level of beehive production, achieved during the war, will probably never be seen again.

The coal mines were never closer to nationalization than in 1943, and it is with this fact firmly in mind that the operators are wondering what the demands will be on or before April 1, 1947. They already know they will not be in too good a position to bargain; they will be compromising on new demands, since everything was granted that was proposed before. John Lewis' coal monopoly will make him tough again.

SCRAP SUPPLIES

Although probably the raw material in shortest supply now and during the war years, yet never completely exhausted, scrap iron and steel supplies will continue to be scarce through 1947. Unwillingly embroiled in finished steel prices, facing an uncertain technological future, and still suffering from inexpertly administered bureaucratic hypodermics, scrap will remain a problem child for some time to come. Efforts to spur shipments of battlefield scrap, shipbreaking and surplus property scrapping will aid the near term picture, but will not materially affect the long term situation.

By T. E. LLOYD

Pittsburgh Regional Editor,

THE IRON AGE

IT IS generally accepted that war is the mother of scrap, but following the greatest war in the history of the world with a colossal wreckage of mechanical equipment, scrap is probably the shortest raw material item in the country today. The answer to this seemingly paradoxical situation is the fact that war equipment and material were not used in this country, but were shipped to all points of the world. The United States acting as the arsenal of the allies, shipped arms out of the country to be wrecked on the battlefields of Europe, China, and islands of the Pacific, and to be lost in the oceans of the world.

Iron and steel scrap inventories have been constantly shrinking during the past 3 yr and scrap collections seem to be losing ground to the bottomless maw of a steel industry that has increased its production capacity to fight a war. Peak inventories were reached, as shown in fig. 1, in December 1942, when stocks on hand totaled about 6,900,000 gross tons, and have continually declined until at the end of September 1946 (the latest figures available), the U. S. Bureau of Mines showed that there were only 2,900,000 tons of scrap in inventory.

The steel industry, at present operations, needs a minimum of 3 million tons on hand at all times to be assured of uninterrupted operations, so it can be seen that present stocks are reaching dangerous lows. The September low point, going into the winter season when dealer and collector pickups drop off sharply, worried steel mill officials. Only the fact that the weather has been mild during the past 3 months, permitting continued collections, has prevented a sharp curtailment of steel operations for want of scrap. Fig. 2 shows the movement of scrap stocks and consumption from 1942 through 1946.

Collections Meet Minimum Needs

While scrap stocks are low, it does not necessarily follow that steel operations have been curtailed. As a matter of record, production of iron and steel has, until the short interval of the November coal strike, surpassed former peak peacetime production. The production drive in steel, started shortly after the termination of the coal strike last May, saw operations sustained at close to 90 pct of capacity, despite the fact that during that entire period scrap was in short supply. Quite obviously scrap collection efforts met minimum requirements, but few authorities are willing to predict how soon collections will fall behind and, as a result, steel operations are curtailed.

Further, despite statements to the contrary, pig iron consumption during the scrap shortage did not increase sharply, nor did the pig to scrap ratio get far out of balance. As a matter of fact, greater proportions of scrap were used in 1946 in steel plants than were used during the war years.

The pig iron to scrap consumption balance from 1942 to 1946 never got very far out of line. The scrap-pig iron ratio in steelmaking in 1939, was 56.3 pct scrap to 43.7 pct pig, a ratio that dropped to 49.1 to 50.9 pct in 1940. Since that time the ratio has been in the neighborhood of 50 to 50 pct, but in 1946 the trend reversed and the melting furnace charge consisted of 51.4 pct scrap and 48.6 pct iron.

The obvious question concerning scrap seems to be: "Where is it?" The answer is not simple because many factors impinge upon the problem, and the skeins of the problem are interwoven to the extent that no single clear, concise answer can be found. Prior to the end of price controls it was generally believed that OPA price ceilings slowed down the flow of scrap. Combined with this was the fact that production of steel processors and fabricators had not climbed to a level comparable with production in the steel industry, thus retarding the flow of industrial scrap. However, the end of price controls early in November did not cause a boom in scrap movement and the supply of scrap still is not as great as the demand. This suggests that price control alone was not the answer to the scrap supply problem.

Problems of Price Control

Some of the aspects of the price control system on scrap have caused difficulty among dealers, especially from June 1946, until the end of price ceilings. In June, at a meeting of members of the Institute of Scrap Iron & Steel, at Cleveland, it was decided that the scrap industry needed a price increase of $3.50 a ton, the request for which was presented to OPA for consideration. The steel industry, fighting mounting costs, was opposed to this increase. The price advance request was presented to the OPA's advisory committee, consisting of steel mill and scrap representatives, but it was turned down. Dealers throughout the country were disgusted, disillusioned and downright irate.

Scrap interests made up a majority of the OPA committee and it seemed a certainty to outside observers that the committee had recommended the requested price increase. However, the facts are that the committee did not recommend a price increase. What happened was simple but never widely known. Prior to the price increase request, mills were accepting practically any scrap solid as low phos, paying a premium of $2.50 a ton over the No. 1 heavy melting ceiling price. When the question of higher scrap prices was brought before the committee, steel mill members made it plainly understood that if the price increase were granted, strict grading would be inaugurated and scrap would have to be sold on grade prices.

Rather than risk losing the low phos market for all solids and at the same time increase preparation costs in the dealers yard, the dealers themselves voted against the price increase. When large brokers and dealers could obtain graded scrap at grade prices from

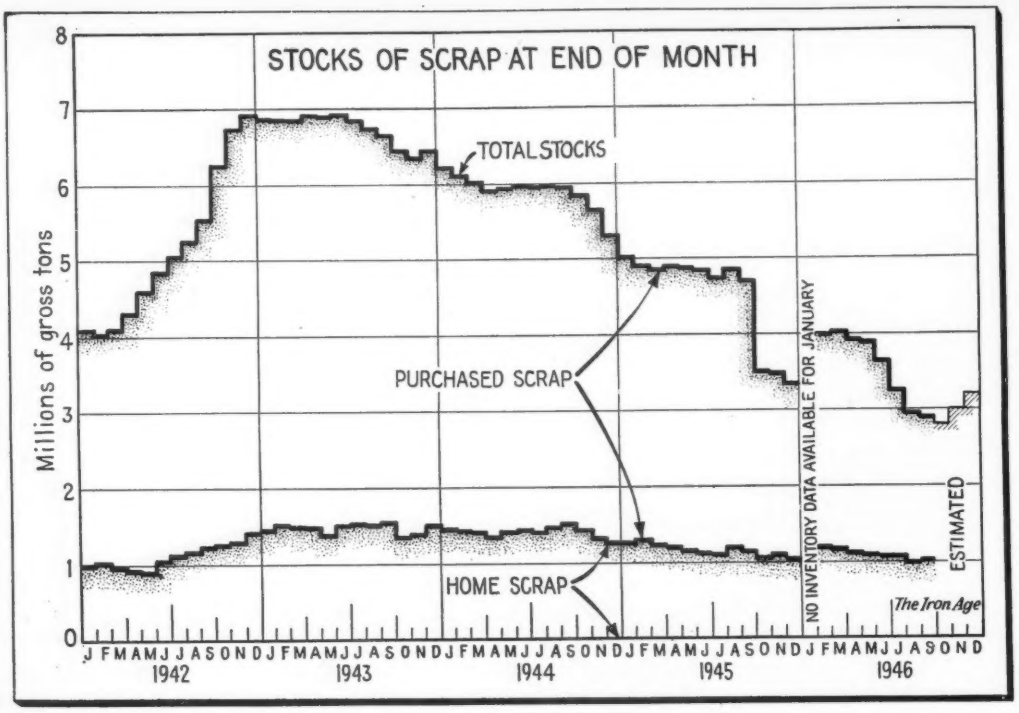

STOCKS OF SCRAP AT END OF MONTH
TOTAL STOCKS
PURCHASED SCRAP
HOME SCRAP
NO INVENTORY DATA AVAILABLE FOR JANUARY
ESTIMATED
Millions of gross tons
0
1
2
3
4
5
6
7
8
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1942
1943
1944
1945
1946
The Iron Age

FIG. 1—The trend of purchased scrap stocks has been sharply downward since the high point of December 1942, was recorded.

their suppliers, the $2.50 a ton premium for low phos was practically a bonus. Consequently, the price increase never became a reality.

Small dealers all over the country barraged Washington and the scrap institute with complaints and pleas for price relief, but in the face of the OPA advisory committee's recommendations, representatives of the scrap institute were practically laughed out of the OPA offices. This situation, however, caught the industry short, for OPA began rigidly to enforce grade specifications and many shipments were rejected at the mill by OPA representatives. The net result was that until OPA inspections eased off scrap had to be sold on grade, despite the consumers' willingness to accept overgraded material.

The other phase of the scrap shortage, the inability of steel processors and fabricators to reach peak operating levels, has not changed materially with the turn of the year. Bedeviled throughout 1945 with strikes ranging from wildcat departmental walkouts in individual plants to national work stoppages, output of the steel consuming industries (and important scrap producers) never really hit a sustained high level. Typical is the case of the automotive industry. Following their own industry strike, the steel strike, the coal strike, the strikes in parts suppliers plants, and many other production delays, auto production has been far below that anticipated during the closing months of 1945. Further, strikes in individual auto plants, the electrical workers' strike, and the many walkouts and work stoppages in the plants and mines of raw material producers, trimmed automobile production schedules down to about 60 pct of what was originally expected. These strikes hampered output of other finished goods producers, even though they were not in the producers' plants. They caused shortages of vitally needed materials, which in turn limited production, which, again in turn, limited the generation of scrap in these plants. Thus, strikes have greatly aggravated the scrap shortage and made it impossible for fabricators to meet production schedules.

The end of price controls in November caught the scrap industry unprepared and, while happy at the prospects of the free market, the industry has not yet been able to throw off all vestiges of price control. The free market in scrap always has been based upon scrap delivered at the consumer's plant. The year closed with the industry still quoting scrap on an f.o.b. shipping point basis and the 50¢ a ton commission, instituted by the OPA for the broker, has been absorbed in the quoted price but it is still very definitely in existence. Prices quoted weekly in THE IRON AGE are delivered prices for scrap generated in the area of the quotation, but scrap from more distant points is billed with freight. Consequently, the prices shown would average between $2.00 and $2.50 a ton higher if average freight charges were included. Another 3 months should see the trade go back to delivered prices, and quotations will then cover all freight.

The abolishment of price controls caught both sellers and consumers of scrap flatfooted and for the first week the market was chaotic, with dealers unwilling to sell and consumers unwilling to buy. The first buying offer came immediately in Pittsburgh, showing advances of $2.50 on all grades, but dealers were unwilling to accept for fear that they would be unable to cover. Despite this offer, solids continued to move at low phos prices and the market immediately became $25.00 to $25.50 on No. 1 and No. 2 heavy melting scrap, a total increase of $5.00 a ton. At writing, the market has already broken through the $25.00 level and is rising beyond $30, despite mill resistance, and the return of the coal miners to work seemed to assure a price advance that will be steady, if not spectacular, and probably subject to interruption if a steel strike accompanies the CIO-USWA wage negotiations.

The general scrap supply picture from a domestic standpoint does not seem too attractive. Irregular production of fabricators will limit the supply from this source. However, a recent government tariff pub-

lication stated that the "supply of scrap from surplus war materials and other sources probably will be adequate to permit the restoration of a normal ratio of scrap to pig iron" and imports may increase "above the level of 1939 but probably will continue to amount to only a fraction of 1 pct of consumption." This publication takes for granted that War Assets Administration will soon speed up the movement of scrap—possible but not too likely. WAA has, however, within the past 2 months, issued to its regional directors a new manual designed to speed up the classification of material as scrap and its disposal.

The longer term outlook on scrap, according to the same report, seems to indicate that the consumption of scrap will hit a level exceeding the wartime consumption rate, possibly amounting to 60 to 65 million tons a year, and supplies of scrap probably will be adequate. Consumption of scrap during the war years, as compared with stocks of scrap, is shown in fig. 2. This seems to be an optimistic viewpoint not entirely warranted by present conditions and not entirely shared by industry observers. Consumption plotted against various noteworthy historical events is shown in fig. 3.

The huge demand for scrap by the openhearth steelmaking process has been supplied primarily during the past 25 yr from bessemer steel produced prior to World War I. During those same 25 yr, bessemer steel has become a less significant factor in total steel output. However, the steel from the converter process has been the equivalent of a scrap mine for the openhearth furnaces, and, like high grade Mesabi iron ore, this scrap mine is approaching exhaustion. The quality of steel produced in the past 25 yr has been improving; its expected life is continually being increased. The generation of scrap from the wrecking of capital equipment, buildings, bridges, and other major long term sources is slowing down. With the high steel production rate and the diminishing return of scrap, some observers feel that a continual scrap deficit is on its way in this country. Coupled with decreasing supplies of high grade iron ore, this problem is serious and will tend to increase the cost of producing steel and increase its selling price.

This condition will be alleviated to some extent by technological development of low scrap consuming steelmaking methods, primarily the bessemer. Developments already made and some still in the making will likely increase the use of bessemer steel. Bessemer will likely become a greater factor in steel production and also become more and more a substitute for scrap, specifically in the form of partially blown metal—duplexed metal—that is charged into the openhearth for final refinement.

Thus, it is hard to see how this country will continue to be a scrap plus nation, with sufficient scrap to supply all domestic needs and still leave some for export. Certainly, substitutes such as duplexed metal or synthetic scrap from the bessemer, will be made, but with steel quality and expected useful life increasing every year, the turnover of new steel to scrap will be slowed up tremendously.

Battlefield Scrap

Considerable interest has been shown lately in the U. S. Government's attitude toward battlefield scrap. This is a sore point with many in the scrap business, because it was only recently that it became possible for an American businessman to get into the war scrap business, except for that which was shipped back to this country by the government, mainly as ballast.

From Sept. 12 to Oct. 25, 1945, a committee of top ranking scrap and steel mill officials, under the direction of the U. S. Army Service Forces, toured the European and Mediterranean theaters of war to find out just what conditions were with regard to scrap in those areas and just how much existed. In a report, made from daily records kept on the trip, the committee analyzed the situation on a country to country basis, and, generally, recommended that all ferrous scrap ⅛-in. and thicker, including that generated from captured enemy and American-produced surplus ammunition, be returned to this country. The only exceptions to these recommendations were: (1) Scrap in Italy, including U. S. ammunition, be sold to the Italians; (2) scrap lighter than ⅛ in. thick be dis-

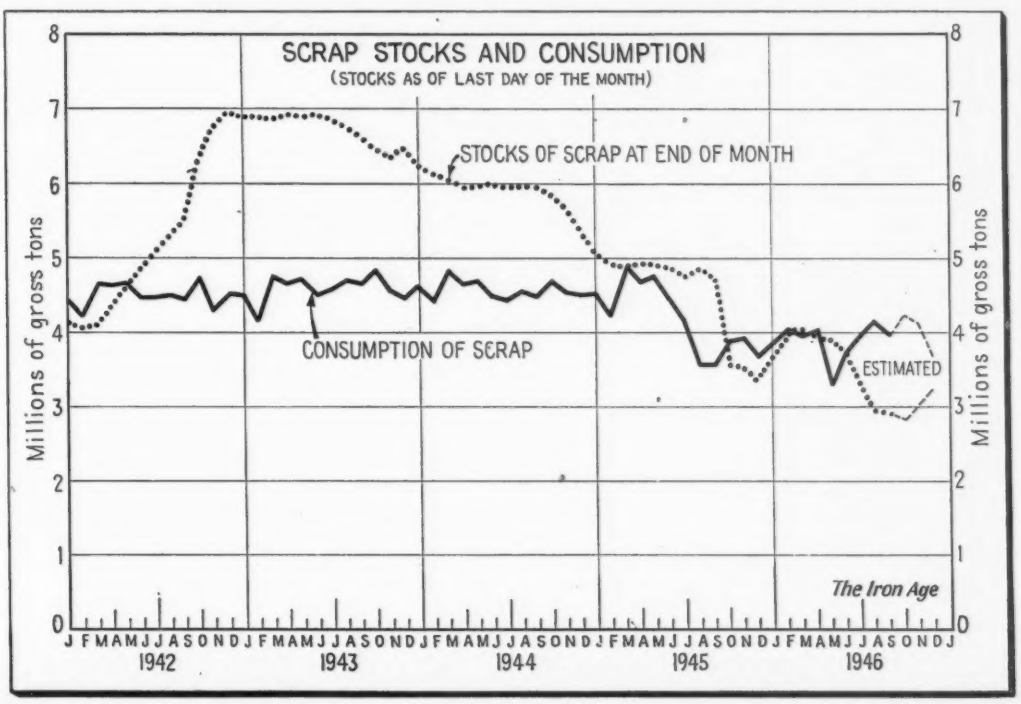

SCRAP STOCKS AND CONSUMPTION
(STOCKS AS OF LAST DAY OF THE MONTH)
STOCKS OF SCRAP AT END OF MONTH
CONSUMPTION OF SCRAP
ESTIMATED
Millions of gross tons
Millions of gross tons
0
1
2
3
4
5
6
7
8
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J
1942
1943
1944
1945
1946
The Iron Age

FIG. 2—This comparison of scrap stocks and consumption illustrates the drastic drop in stocks, as against the fairly consistent rate of consumption.

posed of locally; and (3) scrap not practicable to pick up in Germany be disposed of locally.

On Nov. 28, 1945, against the specific recommendations of these experienced scrap men, a committee of high ranking government bureau officials, headed by OWM&R's deputy of production, stabilization and war liquidation, Harold Stein, chose to ignore completely the report of the Overseas Scrap Advisory Committee.

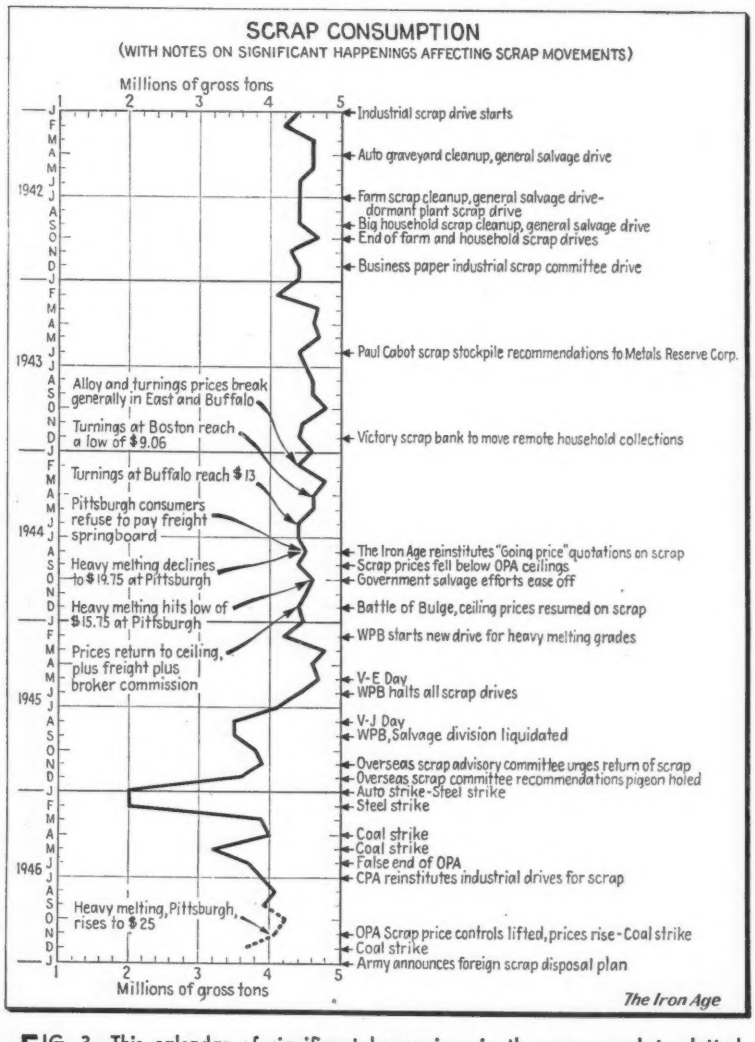

SCRAP CONSUMPTION
(WITH NOTES ON SIGNIFICANT HAPPENINGS AFFECTING SCRAP MOVEMENTS)
Millions of gross tons
2
3
4
5
1942
1943
1944
1945
1946
Industrial scrap drive starts
Auto graveyard cleanup, general salvage drive
Farm scrap cleanup, general salvage drive-dormant plant scrap drive
Big household scrap cleanup, general salvage drive
End of farm and household scrap drives
Business paper industrial scrap committee drive
Paul Cabot scrap stockpile recommendations to Metals Reserve Corp.
Alloy and turnings prices break generally in East and Buffalo
Turnings at Boston reach a low of $9.06
Victory scrap bank to move remote household collections
Turnings at Buffalo reach $13
Pittsburgh consumers refuse to pay freight springboard
The Iron Age reinstitutes "Going price" quotations on scrap
Heavy melting declines to $19.75 at Pittsburgh
Scrap prices fell below OPA ceilings
Government salvage efforts ease off
Heavy melting hits low of $15.75 at Pittsburgh
Battle of Bulge, ceiling prices resumed on scrap
WPB starts new drive for heavy melting grades
Prices return to ceiling, plus freight plus broker commission
V-E Day
WPB halts all scrap drives
V-J Day
WPB, Salvage division liquidated
Overseas scrap advisory committee urges return of scrap
Overseas scrap committee recommendations pigeon holed
Auto strike-Steel strike
Steel strike
Coal strike
Coal strike
False end of OPA
CPA reinstitutes industrial drives for scrap
Heavy melting, Pittsburgh, rises to $25
OPA Scrap price controls lifted, prices rise-Coal strike
Coal strike
Army announces foreign scrap disposal plan
Millions of gross tons
The Iron Age

FIG. 3—This calendar of significant happenings in the scrap market, plotted against the rate of consumption, highlights some of the varied problems faced by the scrap industry over the past 5 yr.

because "any present scrap shortage in the United States is *probably* caused by price and wage considerations." Mr. Stein recommended that all ferrous scrap be allowed to remain in Europe except that needed for ship ballast. This recommendation was approved by the committee.

Less than 1 yr later, on July 15, 1946, OWM&R mapped out a ten point program of emergency action designed to speed the flow of scrap to steel mills, the fourth point of which was to notify Army authorities overseas of the urgent need for scrap in this country and to instruct them to speed up the return of military scrap wherever possible. Two days later, on July 17, CPA issued a statement that indicated battlefield scrap was coming back to the United States at the rate of 20,000 tons a month. Whether or not this figure is accurate is not known, but in any event it is a mere dribble of what could have been obtained immediately after the close of the war. On Dec. 5, 1946, the Army announced that it would offer for sale, through sealed bids to American buyers only and for shipment to the United States, scrap held by the Army in Europe.

This action was made possible only through changes in the law at the urgency of the Office of International Trade, successor to the Foreign Economic Administration. Until late in 1946, the law forbade the return of any surplus Army material from any foreign country that would be sold in this country in the condition that it was originally purchased. Thus scrap could not be returned to the United States through business channels because it would be sold here as scrap.

When the Army announced its new sales policy in December, it was estimated that about 100,000 tons of scrap would be immediately available from dumps and collections in Europe and another 300,000 tons would be available over the next year. These figures are picayunish when it is considered that Col. Charles N. Bell, on the Stein committee, said that in Europe as of Nov. 28, 1945, there were 200,000 tons of scrap immediately available and from 1 to 2 million tons ultimately available. Because the government had to move the scrap back to the United States under laws then standing, Mr. Stein said that the sale of scrap at the price ceilings prevailing then would result in a loss to the government. This loss would represent a subsidy to the steel industry, which was contrary to government policy. Yet, 1 yr later the way has been paved for American scrap interests to do the same job themselves.

By waiting a full year, much of the immediately available scrap no longer exists. Much has been sold locally to French, Belgian, Italian and British scrap interests and much of it has just "plain disappeared." All through the report of the Overseas Advisory Committee, it was repeatedly stated that "unguarded accumulations of scrap in liberated areas are subject to pilferage, which may result in the loss of the entire accumulation."

There has never been a comprehensive inventory of scrap accumulated in liberated Europe and the American occupied zones, but fragmentary data that have come to light give some indication of what the potential was at the end of the war. There were reported to have been 240,000 tons of signal equipment in France, Belgium and Germany; 54,000 tons of 20-lb fragmentation bombs in ETO; 700,000 tons of American owned ammunition in France and Belgium (300,000 tons of which was ordered sent back to the United States); and 300,000 tons of captured enemy ground force ammunition tabulated in the American zone in Germany.

When the Pacific theater is considered, the scrap potential is much greater. The scrap generated by the Pearl Harbor bombing alone is great, as evidenced by several large tonnage sales in the past. Speaking

in Boston several weeks ago, Edwin C. Barringer, president of the Institute of Scrap Iron & Steel, stated that the neglect of overseas sources of scrap is a handicap and that with a little aid dealers could move 100,000 tons of scrap quickly from Pearl Harbor. Dealers, to do this job, must be able to borrow or purchase a small amount of equipment. He said that a year after the Overseas Advisory Committee on scrap urged the return of heavy scrap from Europe, the pig iron industry is being subsidized as much as $12 a ton and a belated effort is finally being made to "return the comparatively little scrap that remains in the European theater."

It was in this manner, with the usual parade of side issues, that officials in Washington have dribbled away a large reservoir of scrap in Europe. Likewise, the sale of American equipment "as is, where is" to other nations, such as the recent Chinese purchase, is placing beyond reach much of the scrap in the Pacific. Certain OWM&R officials point out that the scrap involved in these sales to China could probably be bought back and shipped to this country, but if the past is any criterion of the future, the time lapse involved between the idea and its execution will be sufficient to disperse any accumulations. So, to all practical purposes this scrap, too, might well be considered gone.

Another facet of the scrap supply picture is that of scrapped Naval and Maritime Commission ships. The ship disposal plan got under way with a blaze of newspaper and magazine publicity that promised huge tonnages of scrap quickly at the time when the scrap shortage was acute—in July 1946. The task undertaken was of mammoth proportions and scrap did not immediately materialize. As a matter of record, shipbreaking hit a pace that is only now yielding between 40,000 and 50,000 tons of scrap a month, a rate that will be doubled by the end of the third quarter, 1947, if plans work out. Until Dec. 1, 1946, the actual scrap yield from shipbreaking was only about 180,000 tons, whereas promises in July were for about 725,000 tons by the end of the year.

Officials in charge of this program expect shipbreaking, which is pretty much of a new industry in this country, to yield about 1 million tons of scrap a year for the next 5 yr. When the program started there were only three experienced shipbreakers in the country: Boston Metals Co., Baltimore; Patapsco Scrap Corp. (Bethlehem Steel Co.), Baltimore; and Northern Metals Co., Philadelphia. These companies were set up to handle ship scrapping. The newcomers, now numbering about 25 or 30, had little or no facilities and, while familiar with the scrap business, they were neophytes at shipbreaking. The leasing arrangements for government-owned shipyards, where the ships could be broken up, bogged down under government red tape. Yet, after 6 months, through individual initiative and the leasing of perhaps a half-dozen government-owned shipyards, ships are being broken up in some 25 to 28 locations.

As of Dec. 1, the Maritime Commission sold some 150 ships that will break up into about 560,000 tons of scrap. Now up for sale are ships that will yield another 240,000 tons. The Maritime Commission will be the greatest source of ships for breaking during the coming few years, and the program as set up is intended to provide a steady supply of surplus ships. There are at present some 1450 Maritime vessels laid up and out of service, plus 2500 Liberty ships the disposal of which is still a problem since some of this fleet is serviceable and will be sold to shipping companies.

The Navy, until Dec. 1, sold as surplus a number of ships that will yield 500,000 tons of scrap and at present there is under consideration another group that will yield 325,000 tons of scrap.

In addition to what the Navy declares as surplus from the present fleets, there will be available lend-lease ships. These include destroyers, destroyer-escorts, carrier escorts, and other types of ships that have not yet been returned to this country. Also, scattered in the Pacific (many at Japan) are some 50,000 landing ships and many harbor tankers and cargo ships, lighters, tugs, oil and cargo barges, and other special purpose vessels that will likely come up for disposal and scrapping.

Ship scrap, when it begins to come out in quantity, will be welcomed by the steel industry. This scrap is of excellent quality and much of it may command a premium price. The fact that the scrap industry jumped into this program whole-heartedly, risking substantial amounts of money, speaks well for the industry's initiative. Shipbreaking, according to leading scrap men, is a risky venture and this present program is privately financed. In the face of increasing costs, no certainty as to where ships can be handled, the huge initial cash investment, and the constant risk of losing an entire vessel when breaking is done on a beachfront, the scrap man new to the shipbreaking business can only be a gambler.

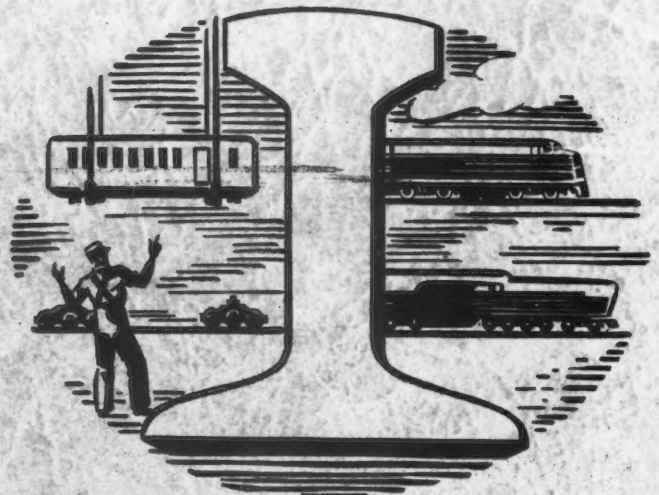
If, as desired, shipbreaking hits a pace of 1 million tons a yr for any length of time, it is pretty certain this new industry is here to stay. By the end of 5 yr, only the efficient will survive and shipbreaking will cover ships bought from shipping companies all over the world as well as from the U. S. Government.

Summarizing, then, it appears at the beginning of 1947 that scrap will be in short supply for the remainder of the year, primarily because of the inability of metal fabricators to hit peak production schedules; the laxness of government in returning battlefield scrap, the slowness of the War Assets Administration in declaring nonusable surplus properties as scrap, and the fact that steel operations will continue close to 90 pct of capacity during those periods of the year that it is not on its back from labor pains. To make predictions that steel production will be curtailed by scrap shortages is foolish, since the country has been hearing of scrap shortages for 5 yr without any real effect on steel production. There may be occasional short lived isolated shutdowns, but the scrap shortage will not cause any widespread curtailment of steel production. Despite scare headlines that will accompany particularly acute shortages at various times, there is little likelihood that the flow of scrap will get less than it was in June and July 1946.

Prices should level off within the next 6 weeks, hitting a point that will be as high as they will go. This might even be as high as $35.00 a ton for heavy melting. If such is the case, steel prices will reflect this added cost, and scrap prices will never again drop to the prewar averages—that is, not until steel prices come down to about the present levels.

RAILROADS

1947 will be a year of decision for the nation's railroads, one of the metal industry's largest customers. Facing aggressive eternal competition and torn with internal disagreements on mechanical as well as financial matters, it would seem that the roads must overcome, and soon, some of the obsolete practices resulting from an ultraconservative approach to technical developments. That this can be done to the benefit of the roads has already been demonstrated by a small group of railroad engineers.



By D. I. BROWN
Chicago Regional Editor
THE IRON AGE

THE bulk of this nation's Class I railroads are broke or in dire need of financial overhauling. Many require major changes in their mechanical and operating divisions. No other large user of metals has so few up-to-date materials men or such a complete misconception of modern metallurgical practices. The revisions which must be made call for a drastic change in old line thinking from the top down. Last year's nationwide car shortage, along with the widely publicized hearing for higher rates, has focused attention of the entire country on this industry and has resulted in many hasty conclusions by the public. Heavy industries are closely calculating the effect of the new rates effective Jan. 1, the outcome of which well affect the future distribution of all products and hence the location of new manufacturing plants. Coal interests are fighting the inroads made by oil with new twists having entered this long standing contest.

The battle is on. Many issues are not yet clear, but our "20 pct industry" is in the midst of a momentous struggle which points to 1947 as the year of decision.

1947—Year of Decision

During the 1946 hearings of the Interstate Commerce Commission on higher rates, all the roads warned that they faced ultimate disaster unless higher revenues were forthcoming to meet increased material costs, wages and tax obligations. Dr. Parmelee, director of the bureau of railway economics, at the Chicago hearing in July said, "The rise of cost of operation has been so great that even with the partial freight rate increase granted, the results of the year's operations will be a net loss." He substantiated his statement with an object lesson in economics, backed up with nice round astronomical figures, and predicted "a $30 billion deficit in 1947." Roy B. White, president of the Baltimore & Ohio, summed up at the same hearing with, "If our railroad transportation is to continue to be provided by private capital, it must be kept sound at a rate level that will sustain it." Later, following the annual directors meeting in November, Mr. White said, "A tax carryback of about $19 million which the B&O will use this year is the only thing that will prevent us from going $15 million in the red."

The poor financial statements from last year's operation may mean decreased railroad expenditures this year. The roads buy 20 pct of all the coal mined, 20 pct of the fuel oil and lumber consumed in this country and a little less than 20 pct of the iron and steel products. Any cutback in railroad maintenance, new equipment and improvement programs, will be seriously felt by the rest of the country's industries. It has been estimated that a cool $1 billion earnings, before taxes and other fixed charges are deducted, are needed by the Class I roads to stay healthy. Fluctuations in equipment orders are shown in fig 1. Some idea of the extent of railroad purchases is available from the value of year end inventories of materials and supplies of Class I railroads, storehouses and yards. From 1936 to 1945 inclusive the average figure was $437 million.

It seems more important to determine why the roads are broke and attempt to plug the leaks than just to grant how much they need to keep going. Examination of past practices and clarifications of recent railroad developments are important in this consideration. To begin with, the greatest engineering mistake in history was the adoption of the English gage, according to James Marshall in his book "Santa Fe." The present 4 ft 8 in. standard gage is identical with the wheel span of the Roman chariot and is indicative of the early lack of foresight in planning the rail transportation system. The backwardness of railroads has been bewailed since their earliest days, but many such statements are unwarranted. The failure of the roads, however, to keep pace with modern technological advances in metallurgy and design is, unfortunately, too true. Yet, the 25,000 odd parts comprising the modern steam locomotive represent such an audacious series of compromises that the men who evolved it begin to appear as very special types of genii.

Switch From Steam to Diesel

Beginning at the head end, and prominent from today's operating standpoint, is the current switch from steam to diesel power. Diesels long ago replaced steam in large stationary power plants and later took over in marine installations. Starting in the late 30s diesels threw down the glove to railroad steam motive power and have made amazing progrss. In 1935, 20 pct of the new locomotives ordered by the railroads were diesels, in 1937 it doubled and 4 yr later reached 62 pct. Just prior to the war 76 pct of the new motive power was diesel and today the figure is approximately 86 pct. (See table I.) Diesels made their first conquest as switchers. On May 12, 1936, the first regularly scheduled dieselized Super Chief on the Santa Fe raced from the Dearborn Chicago Station to Los Angeles, surpassing the best previous passenger time by 5 hr and 20 min. Union Pacific's dieselized City of Portland, in October, 1934, had previously clipped many hours off the old transcontinental steam record. During the war, diesels of 1940 vintage established remarkable performance in hauling freight and more of the roads swung over to this kind of power. As the lugging of tonnage is the soul of railroad revenue, this feat was the final assault on the reciprocating steam engine.

Many of the nation's large roads have not fully accepted the new prime mover. The heavy coal hauling roads have been least receptive to the current trend. The C&O, N&W and the Virginian haven't a single diesel unit in service. The use of coal or oil is primarily governed by simple economics. Some large coal haulers refuse to use diesels despite the higher efficiency, availability and lower maintenance, simply because their revenues are earned by hauling coal. Approximately

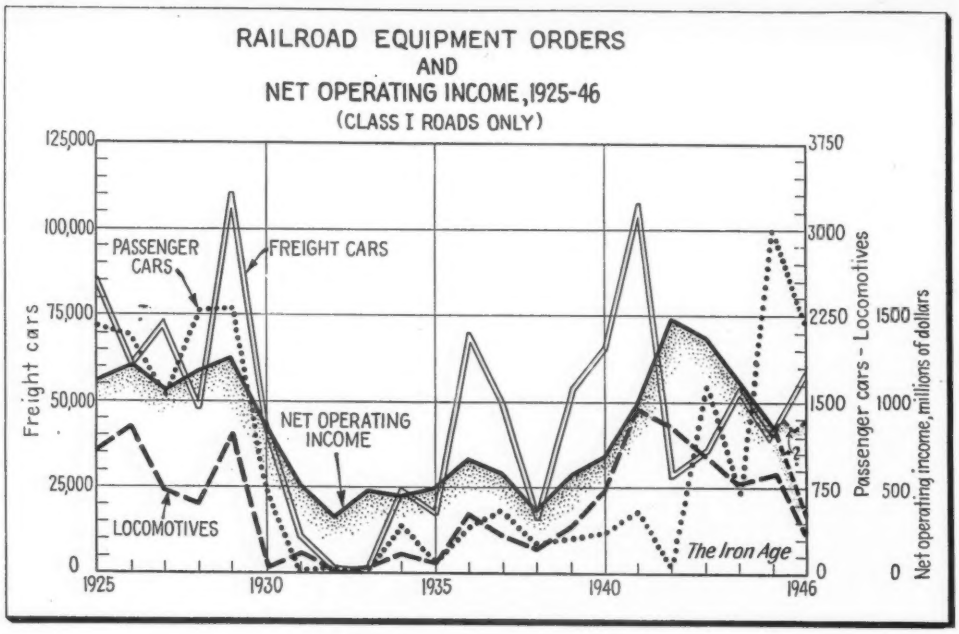


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FIG. 1—A comparison of railroad equipment orders and net operating income for the period 1920 to 1946.

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FIG. 2 — Schematic sketch of arrangement of equipment for the coal burning gas turbine driven locomotive being developed by Bituminous Coal Research.

one eighth of all revenues of American railroads is bituminous coal traffic. In 1945 the locomotives of the Class I roads consumed 115,049,000 tons. The long successful use of oil burning steam engines on western roads, by Santa Fe, Southern Pacific and others, was a natural not only because of the proximity and lower cost of oil but also because the choice did not cut the roads' revenues. When the diesel came along, the roads not tied up in coal traffic enthusiastically accepted this type of power. Oil burning steam engines still outnumber diesels, but as the oil burners are at best a compromise embracing all the ills of the iron horse, the roads are replacing them with diesels as fast as possible. As of Jan. 1, 1945, there were 6906 oil, burners in service.

Cost studies by roads using steam and diesel power have convinced them of the superiority of the diesel. The first railroad to be 100 pct dieselized will be the Alton which expects to supplant all of its 166 steam engines with diesels by April 1 of this year. Comparative maintenance costs on this road showed diesels to be 8.5¢ per mile, while steam cost 49¢ per mile without including water treatment and affiliated charges. Since the Alton swung to diesels, C. M. House, superintendent of motive power, told THE IRON AGE that his maintenance crews have been cut 48.5 pct and further savings will be realized when steam is completely eliminated.

The real issue is no longer steam versus diesel but rather coal versus other fuels. From an American standpoint alone, the most romantic but most inefficient prime mover ever known to man is on its way out, but not necessarily is coal as a fuel. Bituminous Coal Research, Inc., with large funds and backed by the large coal hauling roads, has been hard at work developing a railroad gas turbine[1] to utilize coal as a fuel. An authoritative sketch of a coal burning gas turbine driven locomotive is given in fig. 2.

Under the direction of Dr. John Yellot, at Johns Hopkins University, Baltimore, a pilot coal burning turbine has been under development for railroad application and may save the day for coal. Two major problems, suitable pulverization or atomization and disposal of fly ash in the combustion chamber have for the most part been solved, and, according to this group, it remains only to fit the system into standard locomotive dimensions. How soon the coal burning turbine will be available is a matter of conjecture. A trial stationary installation will be made at Kaiser's Fontana plant in the spring. Many engineers believe an oil burning turbine will appear first. The Allison Div. of GMC has had considerable experience with jet engines and turbines and these developments are being closely followed by a sister company, Electro-Motive which is the largest producer of railroad diesels.

[1] *This coal fired gas turbine locomotive was described in* THE IRON AGE, *Sept.* 19, 1946, *p.* 102.

Coal is still the cheapest and most widely available fuel to many roads and its continued use is of paramount importance to the industry. Since 1940 coal costs have risen more than diesel fuel oil, and coal is destined to rise still further. The bureau of transport economics of the ICC has published the following figures.

8 months, Jan.-Aug.	Coal used as locomotive fuel (tons)	Diesel fuel in locomotives (gal)	Unit cost Coal, a ton	Unit cost Diesel fuel, gal
1940	52,424,282	37,060,028	$2.45	4.81¢
1946	66,456,408	328,416,469	3.73	5.49¢
Increase 1940-46	26.8 pct	786.2 pct	52.2 pct	14.1 pct

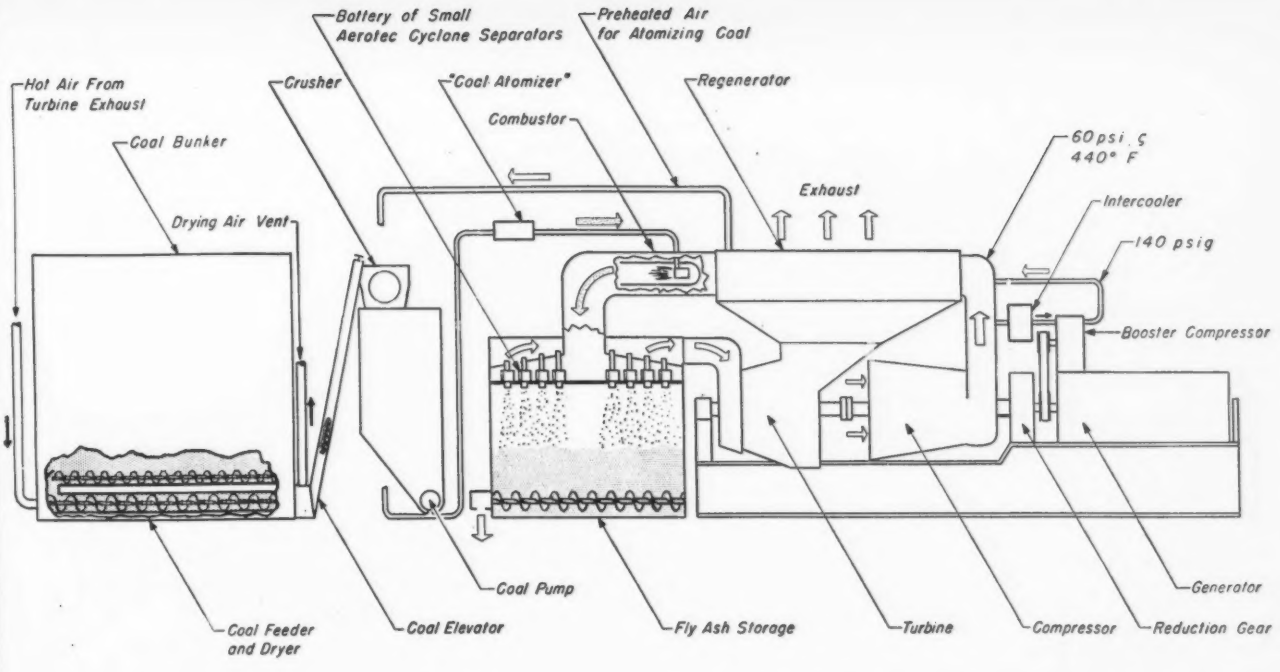
Steam men point out that they successfully withstood the threat of electric power and did not have to redesign the engine to do it. The failure of electric power to make large inroads in our American system is in

TABLE I

Locomotives Owned by Class I Roads
Nov. 1, 1946

Steam	Electric	Diesel
37,571	741	3,352*

* Working diesel units totalled 4302, this figure subject to variation because of the number of units considered as a locomotive.



no way complimentary to the steam engine as the pure cost of electrification and the necessity of high densities of traffic for economical use, naturally settled the issue. Builders of steam locomotives have little to say about design. They receive orders from the railroads and build to meet the given specifications. Builders can suggest but that is about all. There are about as many different types of steam locomotives as there are chief railroad mechanical engineers, and the insistence on special engines for their particular individual needs has been the chief cause of the complete lack of standardization.

In this regard, the diesel is in a much better position. Diesels are sold much like automobiles and railroads buy units with little to say about the main construction details of the equipment. It is true that individual diesel makers put out different types of engines, but within each organization the units are fairly well standardized. Electro-Motive Div. of GMC announced last November, the F3 locomotive[2] for combination freight and passenger service. Through the use of six different gear ratios and the combination of one to four of the new 1500 hp units, or the old 1350 hp units, 28 distinct types of locomotives can be had with the same engine. American Locomotive Co. earlier in the year announced its 2000 hp unit[3]. Necessity of maintaining the many different types of steam engines for the various jobs involved has in the past been very expensive. In the diesel simplicity lies good posibility of reducing operating costs and many of the roads have decided to really exploit this feature.

One of the chief problems facing the roads is adequate up-to-date education and reorganization of the mechanical departments. The scarcity of topnotch material engineers is commonly acknowledged, even by the roads themselves. With a few notable exceptions, the tremendous inertia of old habits and traditions have stymied the progressive railroad engineers who have attempted to improve mechanical practices and thinking of both maintenance and design personnel The few pioneers who have dared the wrath of the systems are certainly worthy of mention. H. P. Haas, director of research, New York, New Haven & Hartford, has instigated sweeping changes and installed an educational system of much merit. Ray McBrien, chief engineer of standards and research, Denver & Rio Grande Western, has effectively campaigned for years for better boiler materials and practices. Considerable research into better steels has emerged from Mr. McBrien's effort, but the tendency of other roads is not to accept such results unless they are rechecked in service over each individual system. This takes considerable time and time is getting very short. H. G. Miller, mechanical engineer of the Milwaukee Road, has done much on improving shop workmanship and has tested many steels in an effort to secure better

[2] *The F3 unit was described in* THE IRON AGE, *Oct.* 24, 1946, *p.* 102.
[3] *See* THE IRON AGE, *Sept.* 19, 1946, *p.* 99.

TABLE II

Influence of Leaky Staybolts on the Mileage Life of Side Sheets

Records of mileage between side sheet renewals and repairs of ten locomotives with staybolts fitted in the conventional manner, that is, screwed through, hammered and ends riveted over, compared with the maintenance-free mileage obtained in three locomotives of the same class and in the same service fitted with seal welded staybolts.

Period	Jan. 1941–April 1945	June 1942–July 1946
Method of Application	Riveted	Seal Welded
Condition of Stays	Leaky	Tight
No. of Locomotives	10	3
Mileage between side sheet renewals		
Average	49,734	.....
Maximum	84,475	.....
Minimum	16,501	.....
Maintenance—Free mileage on side sheets		
Average	12,000[1]	157,476[2]
Maximum	24,000[1]	198,821[2]
Minimum	6,000[1]	96,409[2]
Side Sheet renewals	32	None
Patches applied	6	None
Dumps for caulking leaky stays	960	None
Stays renewed between sheet renewals	1,280	None

[1] Estimated. [2] Actual.

service. T. D. Sedwick, engineer of tests for the Rock Island, and G. E. Baumgartner of the Norfolk & Western, are regarded by the metalworking industry as exceptionally good materials men, although far outnumbered by the ordinary "It's worked for 30 yr, it will work now," type of engineer.

Many of the mechanical men who are capable of improving the situation lack the necessary backing of top management and the modern facilities to carry on the work. It is the rule rather than the exception that railroad material specifications have always lagged far behind the development in the metal industry. There is no such thing as standard practice from shop to shop on the same system throughout the industry. Heat treating practices and testing procedures too often originate and are administered from the home office, and this system of remote control without competent metallurgists on the job prohibits intelligent treatment and use of materials. As the diesels replace the clankers and maintenance personnel and facilities are decreased, the need for materials men will not be so great.

Blaming lack of progress on the ICC will not be cause enough in the future for failure to utilize modern technological advances. John Hall, director of the bureau of locomotive inspection of ICC, although slow to approve developments, has always been within his rights and the only method that can be used to speed up the adoption of better ideas is pressure by the roads, even if it does take an act of Congress to change the ICC rules. The roads have been lobbying Congress for years and business executives believe it is high time they cease demanding funds and start work on progressive measures. The slowness of Mr. Hall to adopt the all-welded boiler hinged primarily on safety. The Delaware & Hudson has had a welded locomotive, a 2-8-0 Class E 6A, 225-lb boiler, in operation since 1937 and the fact that not until August of last year did Mr. Hall partially recognize it is no more a reflection on the ICC than on the carriers.

An important engineering development which the carriers were slow to adopt include the use of roller bearings. It was hardly conceivable that the Timken Roller Bearing Co. had to buy a locomotive and equip it with roller bearings (placed in service May 14, 1930) to convince the largest industry on wheels in the world of the practicability of such application. The Northern Pacific bought this engine from Timken 3 yr later and by April 15, 1941, had 69 such engines in service. Roller bearings are now standard equipment on almost all new locomotives and most of the older large engines have been converted recently.

The heart of the steam locomotive is the boiler and firebox. The sorely needed all-welded boiler is finally here. The Milwaukee, Chicago & Northwestern, NYC, D&H, C&O and Santa Fe all have fusion welded boilers on order. Antiquated firebox design, however, remains. Who, beside the railroads, would take a quality plate, punch it full of holes on 4 in. centers (some have been persuaded to drill them), tap the sheet and thread the bolts with little effort to match threads, peen over the ends of the screwed in bolts and then subject the whole structure to continual contraction, expansion, heat and pressure gradients plus all the stresses in the book, and expect the product not to leak? There are very few engines on which the side sheets do not have to be continually patched. This costly shopping not only runs up maintenance cost but takes the locomotive out of service for from 1 to 2 weeks.

Wrought iron staybolts are still the most popular material in all but a fraction of the steam locomotives in service today. Special bolting steels have been developed (through the Flannery Bolt Co., Bridgeville, Pa.) having fatigue properties, measured by the standard Wobbler test, double that of the best wrought iron. As most roads use carbon side sheets bought to AAR 115, the stiffer bolts cannot always be used as the bending stresses twist the low strength sheets. Alloy sheets such as 0.5 pct Mo to ASTM 204, nickel sheets to ASTM 203, and manganese-vanadium to ASTM 225, can overcome this. The popular 1.5 pct Ni and 0.5 pct Mo steels have for many years been used for staybolts by the Missouri Pacific, Wheeling, and Lake Erie and others, and have given very satisfactory results with carbon sheets. The Santa Fe has recently been successful in using plain low carbon steel for staybolts. The makers of wrought iron for bolts are on the way out. Wrought iron costs more than steel, with the possible exception of the synthetic type made by A. M. Byers Co. If the roads expect a ready supply of staybolt materials, it is going to be necessary to use steel, and the sooner their men are trained to use it, the sooner costs will go down.

There are very few superintendents of motive power or chief mechanical engineers who will not agree that staybolt leakage is the cause of side sheet failure, providing water treatment, operating practice and fabrication are correct. Even the heterogeneous ASTM committee is somewhat together on this. Many roads refuse to use steel bolts solely for the reason that their boiler shop men are not trained in their application.

Methods of seal welding staybolts so that they can-

TABLE III

Class I Railroads—United States

	Month of September		Nine Months Ended September 30	
	1946	1945	1946	1945
Gross operating revenues	$660,401,991	$678,878,856	$5,621,973,863	$6,926,755,435
Operating expenses	529,798,499	620,967,537	4,713,217,845	4,911,444,741
Operating ratio—percent	80.22	91.47	83.84	70.91
Taxes	$49,530,415	$1,784,175	$430,171,688	$1,101,012,822
Earnings, before interest and rentals	67,362,490	43,133,855	365,611,041	778,146,722
Net income, after charges (estimated)	38,500,000	8,848,870	96,500,000	451,565,025

Source: Railroad data.

not leak have been advanced and proved to be sound in experimental tests of long duration. Fig. 3 shows the AAR recommended procedure. Locomotives so built include:

One 4-6-2 passenger, equipped April 20, 1943.
One 4-8-2 heavy freight, equipped April 14, 1944.
One 4-6-2 heavy passenger, equipped June 6, 1944.
One 4-6-4 heavy passenger, equipped Oct. 20, 1944.

In the annual 1946 report of the AAR meeting of the mechanical division committee on locomotive and boiler firebox materials it was stated, "To date there have been no leaky staybolts in any of these locomotives since they were equipped and no cracks in the side sheets." Some of these locomotives have gone well over 170,000 miles and table II lists more supporting evidence. Mr. Hall of the ICC has not yet recognized the development of the seal welded bolt and none of the railroads have taken the time to force him into action. Explosive setting of bolts has been perfected by the joint effort of International Nickel Co. and DuPont. This development deserves attention. It is now well established that if leakage can be prevented side sheet life improves. Cooperative research by Mr. McBrien, D&RG,W, and Mr. Purcell of the Santa Fe, has proved that residual aluminum is as important as alloy content so that with seal welded bolts alloy sheets may be unnecessary.

The few instances cited are typical and represent a small fraction of what past practices have been on the mechanical end. There is tremendous room for improvement, not only in the mechanical departments but throughout the organizations and into the strata of management and basic guiding policy. In 1945 $557,076,000 was spent by Class I railroads for locomotive repairs. Surely the possibilities of cutting maintenance by even 10 pct ought to be of primary interest. Now that the roads have been granted the higher rates they need to keep going, or the nation has a right to demand a higher based metabolism of the industry, as history has proved that the stimulant of money alone will not cure a sickened giant.

Robert R. Young, explosive chairman of the board of the C&O, who on Oct. 15 last year charged that the Pennsylvania and NYC were running the AAR, and threatened withdrawal from that group, started fissures in this influential body which may produce wide repercussions. Mr. Young's crusade for progress and modernization is commendable, but it is held by some to be typical of railroad philosophy. There are those who recommend closer scrutiny of home fences first. The long list of engineers, metallurgists and materials men, who for years have filed into the office of A. G. Trumbull, chief mechanical engineer of the advisory committee of the C&O, Erie, Pere Marquette and Nickel Plate in Cleveland, attempting to clarify and modernize car and locomotive material specifications and design, is a case in point.

Most of the steam motive power running today needs to be replaced. As of last year, 41.5 pct of the kettles in service on the Class I roads were over 31 yr old. Only 13.9 pct were younger than 11 yr but obsolesence does not mean they can be immediately scrapped. Diesels represent but a small percentage of the locomotives in service today. The railroads do not have the funds necessary to replace the old hogs very fast. Even if they had, the building capacity for diesels is insufficient to supply quickly all that are needed. At present the diesel builders have orders for over 1,500,000 hp on the books. Consequently, despite the recent

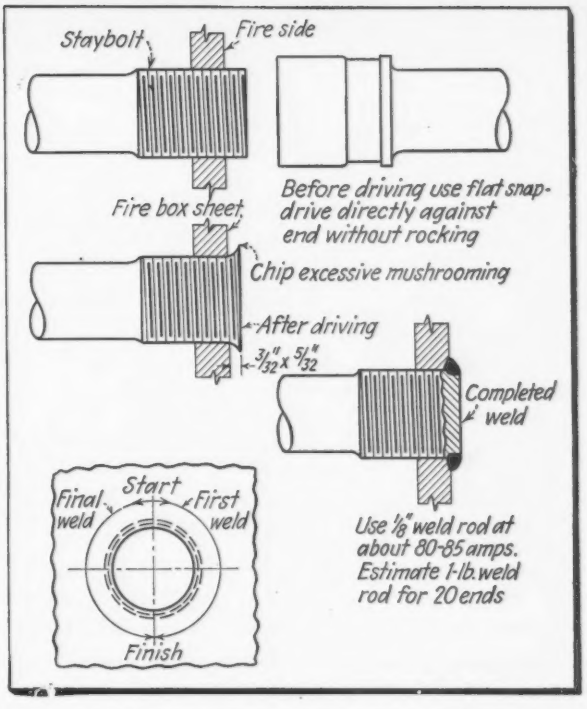
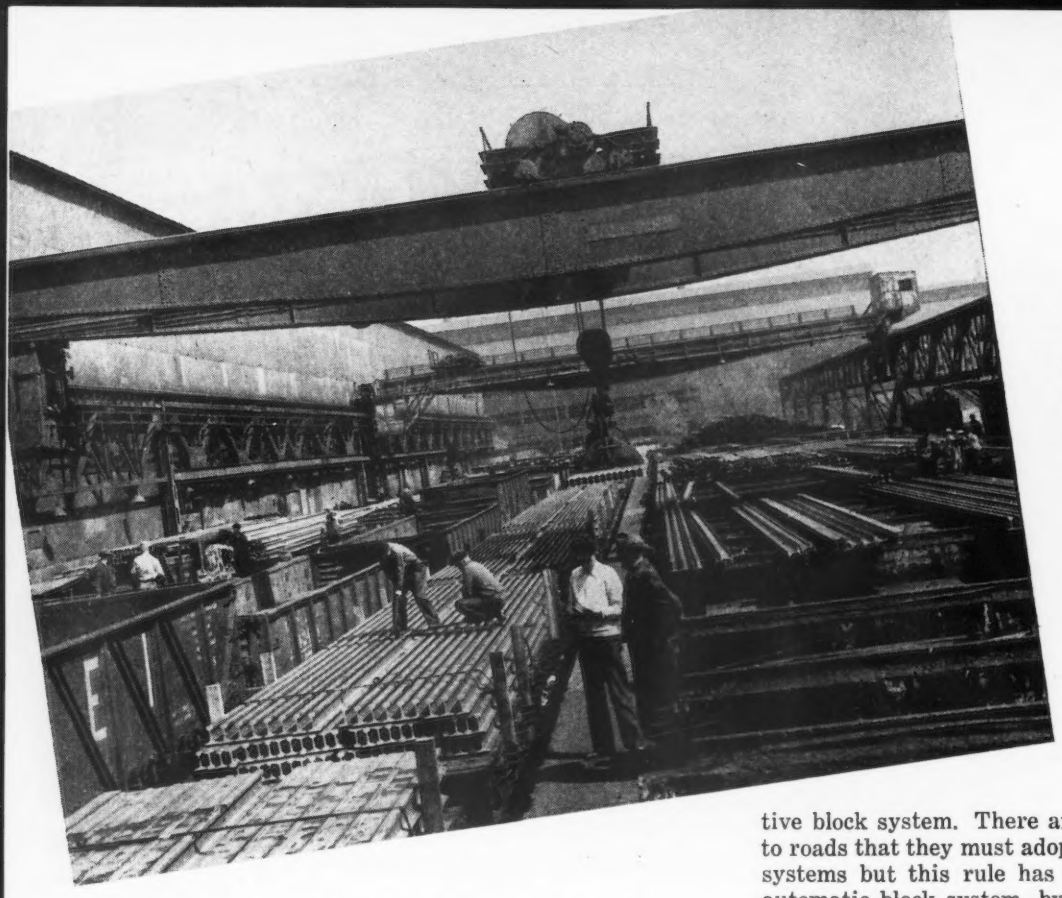


FIG. 3—AAR recommended procedure for grinding and seal welding staybolts on the fire side.

trend toward diesel power, the majority of the railroads in the country are predominantly steam and will remain so for years. More efficient use of present motive power and better steam engines are obviously of immediate interest.

Aside from the recent boiler and firebox developments that could be utilized, the field of quenched and tempered light weight alloy steel motion parts has advantages. The failure of many roads to use such parts stems from a limited number of modern up-to-date facilities to service the equipment. The tremendous reduction of dynamic augment (or plain pounding of the roadbed) and easier adjustment of nosing, which can be obtained through the use of light weight motion parts, was long ago demonstrated by Timken Roller Bearing. Dynamic augment of many locomotives, which is suitable at 60 mph, is prohibitive at 90 mph. Through the use of light weight parts a reduction of dynamic augment of 66 to 75 pct with a corresponding reduction of nosing of 25 to 34 pct is possible. Records of tests in checking dynamic augment on S4 engines of the Burlington, showed that the old heavy, plain bearing motion system produced 30,000 lb. force at 100 mph, compared to 7000 lb at the same speed when using a light weight roller bearing system. Certain compromises have been made along these lines, notably the use of normalized and drawn, manganese vanadium steel parts by the NYC. However, many roads are swinging over to quenched and tempered SAE 4340 light weight parts and more intend to follow. Faster speeds are obtainable with such construction but higher speed engines do not necessarily imply overall faster service and lower cost with additional revenues.

Faster engines alone, cannot be of enough consequence to improve earning statements as fast service is primarily dependent not only on roadbed conditions and effective signal and blocking systems, but is tied up directly with the type of traffic on the rest of the line. Schedules of fast and slow trains must go over the



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YARD of the world's largest railmaker, from whence will come a large portion of the 1,200,000 tons of rails needed by the railroads in the first half of 1947.

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same tracks and, although it is possible to stagger schedules to highball some fast trains, it is not possible to speed up an entire system to match the high-speed special runs. To speed up any railway, more has to be invested in the roadbed than in the rolling equipment. In the past year the mills delivered only about 60 pct of the rails ordered by the carriers. According to CPA, 1,200,000 net tons, minimum, of rails will be needed the first six months of 1946. For the same period, this agency told THE IRON AGE that a minimum of 700,000 net tons of rail accessories are required.

Railroaders say it is dangerous to run traffic faster than such trains can be safely stopped. Considerable development has been directed toward obtaining better brakes. Successful road tests in 1931 led to the adoption of the modern AB brake in 1934, which is now widely used in freight service. At that time the railroads were given a maximum of 10 yr to convert their equipment but this project was slowed down by the war and many of the roads are behind in the schedule of application laid down by ICC. The rate of emergency braking action with the AB brake is 930 ft per sec, which permits application of brakes throughout a mile long train in less than 6 sec. The new compensating brake, just put out by the Westinghouse Air Brake Co., will enable the roads to have better and safer utilization of light weight cars. The braking load on the compensating brake is directly proportional to the load in the car which was one of the bugaboos in adopting light weight freight cars.

Centralized traffic control has been widely advertised by the roads and has stepped up capacity of certain single track lines by 30 pct, but only about 8000 miles of track are so covered. Before the roads go further with centralized control, it has been pointed out that they should first do something about the 50,000 miles of track that are unprotected by even the primitive block system. There are orders on the ICC books to roads that they must adopt suitable automatic safety systems but this rule has never been enforced. The automatic block system, by which a train can protect itself, was developed in 1872. Yet, 70 yr later, nearly 30,000 miles of high speed track remain unguarded by this device.

An insight into the failure of the nation's railroads to modernize signal systems and thereby becoming more efficient and safer for public travel can be appreciated by comparison. Radio communication has been compulsory for 30 yr for ships at sea, the airlines have had complete radio guide and protection for 15 yr, but less than 1 pct of the railroad main line track in the country is so protected. Poor financial conditions are here again cited by the roads as the reason for not improving the antiquated signal system, but is this the real reason?

To say that the steam locomotive has not been improved over the past years would be entirely misleading. Many refinements and better design have been made, many of which were pioneered by the railroad engineers. Higher speed with more horsepower on modern steam engines was achieved with not over 3½ pct added weight to the locomotive. Freight train speeds are much increased and greater availability of steam power has permitted greater utilization of equipment. Better combustion, more steam capacity, more horsepower per lb of engine, have all been notable improvements. Higher availability has been achieved through the use of one piece locomotive beds, cylinders and frames in a single integral casting, simplified valve gears, use of poppet valves such as those employed on the Pennsylvania T1. Top check valves, which introduce cold water gradually into a hot boiler, are being widely adopted and have shown marked improvement in longer side sheet life.

Overall the railroads may have done as much as could be expected under the old system of operation, type of management, and with the antiquated skill of their workmen and the limited funds available. The long series of events that have placed the railroads in

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THE first steam locomotive built in America without cylinders, pistons and rods. It is a 6900 hp steam turbine engine developed jointly by Pennsylvania RR, Baldwin Locomotive Works and Westinghouse Electric & Mfg. Co. The unit has a conventional boiler and firebox and four rod connected driving axles.

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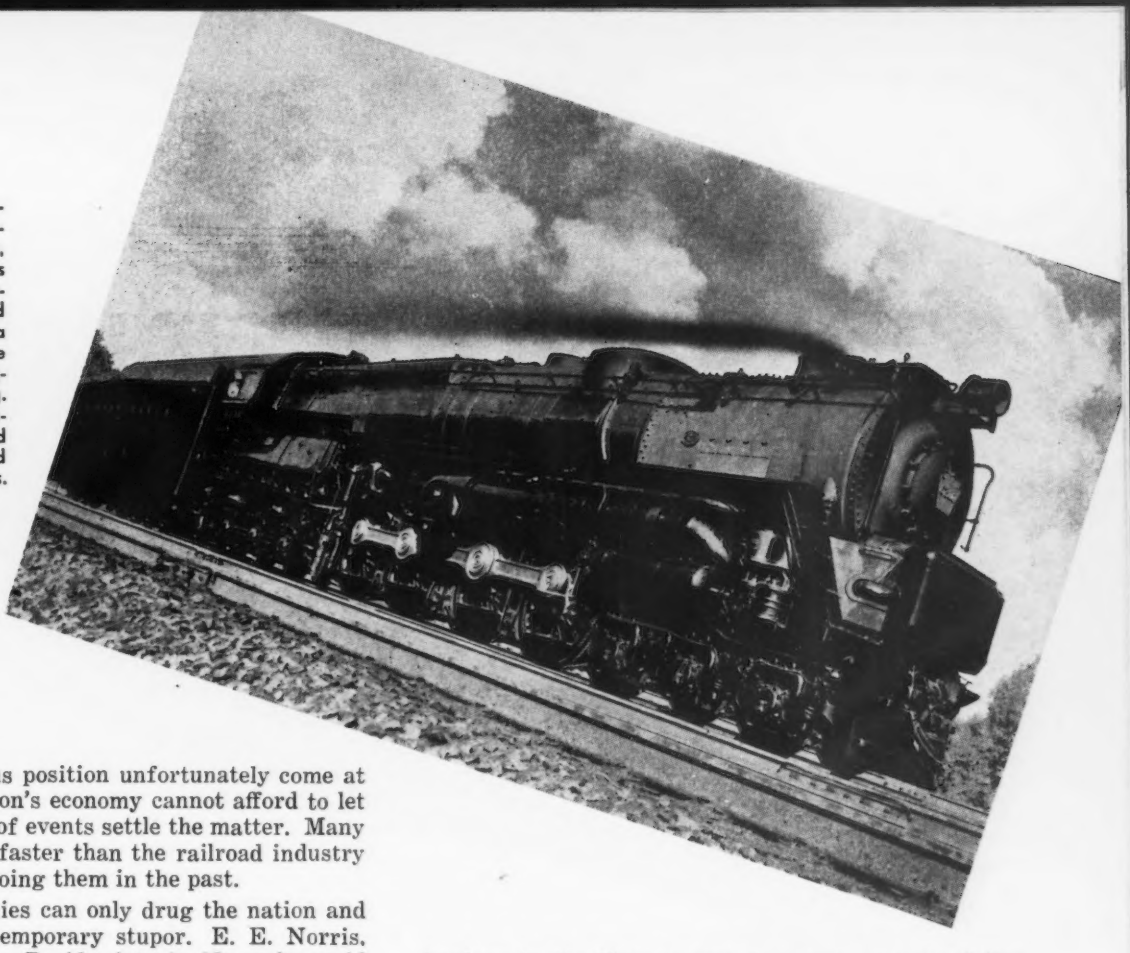


the present precarious position unfortunately come at a time when the nation's economy cannot afford to let the natural sequence of events settle the matter. Many things must be done faster than the railroad industry has been capable of doing them in the past.

Government subsidies can only drug the nation and the carriers into a temporary stupor. E. E. Norris, president of Southern Pacific, late in November told the Traffic Club of Chicago, "Subsidy props must be knocked from under the leaners (airlines and motor freight lines) in the transportation field." He went on to say that, "Unless something is done to encourage investors to put their savings in railroad securities, this invigorating stream of private capital will dry up and the railroad's plans for continued modernization and improvement must be reluctantly packed away in mothballs." C. L. Jellinghaus, vice-president of NYC, at the 23rd annual meeting of AAR in Detroit in November said, "The public is not aware of the immense subsidization from which the competitors of the railroads have benefited for years. Nor does it know that of all agencies of transportation, the railroads are the only ones not subsidized, but they are overly taxed and overly regulated." There is no argument that other transportation has been helped by state and federal laws, but both Messrs. Norris and Jellinghaus overlooked a few things. Since World War I the government has thrice subsidized the roads by buying railway equipment certificates. In 1920 it involved $350 million. In 1934 and 1935, PWA loaned $200 million to 68 railroads on 10 to 15 yr, 4 pct plan. Latest aid was under the National Defense Program of September, 1939. Best available data show that 25 railroads have financed about $100 million of equipment from 1939 to 1941 inclusive. RFC will still purchase 10 yr equipment trust certificates from any carrier upon authorization of ICC, so it is not exactly a one way street.

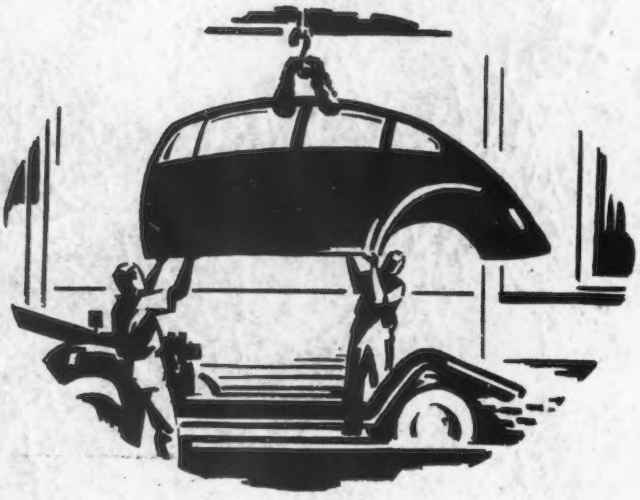
As of now the financial straits of the roads are hanging in the balance. Interest rates on equipment certificates have already begun to stiffen. The yield or earnings on equipment trust certificates, covering the purchases of new rolling stock, are very little better than that available on government bonds. Leading bankers in the Chicago area do not see any possibility of large amounts of new permanent capital attracted to the industry in the future, which is what Mr. Norris was hoping for. Equipment obligations will continue to be bought, as they are the cream and come first in railroad holdings, but other expenditures which must come out of revenues look lean, as new risk capital will be based on the 1946 earnings. Results of the first nine months operation, shown in table III, indicate drastic decreased earnings for all the carriers compared to 1945. Earnings would have been worse had it not been for tax refunds, a device which will not be available next year.

The last freight increase, which averaged 17.6 pct for the eastern district, was a little lower than the 19.6 expected. Most rail officials, however, seem satisfied. Wayne A. Johnson, president of the Illinois Central in discussing the most recent raise granted said, "The one year lag between cost and rate increases, has cost the IC $18 million. That loss can never be made up. Time will tell whether I am correct in my conviction that the full measure of increase requested by the roads was justified and should have been granted without delay." The possibility that individual states may not ok the full grant on intrastate movements will influence revenue. Not until late this year will the figures be available to substantiate whether or not the increase was adequate."

The fight for supremacy of steam over diesel, or coal over other fuels, the crying need for more freight cars, the effect of the new revenues, the modernization of personnel, equipment and the tottering financial structure are all part of the picture. These features add up to the real stake involved, which is the question of survival of the railroads themselves as self-sustaining entities in a free enterprise system. Certainly 1947 will go down as a year of destiny for the carriers.

AUTOMOTIVE INDUSTRY

Plagued by a plethora of work stoppages and wage demands, struggling vainly to explain to a car hungry public why there are but few cars, sweating out the acquisition of every pound of raw materials and at the same time endeavoring to squeeze in some new model work, the automobile industry in 1946 found little cause for rejoicing. But despite these difficulties and an operating loss of $5½ million for the first 9 months, Detroit still manages to find cause for some optimism for the future and its engineers predict that while the atomic car is still not in the near future, the car of tomorrow will show numerous refinements in both style and construction.



By W. G. PATTON
Detroit Regional Editor
THE IRON AGE

THE year 1946 will go down in the personal history books of those actively engaged in the automobile industry as a year characterized by widespread labor strife, aggravating day-to-day shortages of raw materials and parts, pyramiding production costs and grossly unbalanced inventories. During the 12 month period only a few passenger cars were built at a profit to the producer despite large tax carry backs and an average increase in passenger car prices of more than 50 pct as compared with 1941.

In contrast with automobile producers, auto dealers made extraordinary profits during 1946 although new car volume was only half the 1941 total. To be sure, a large part of the dealers' profit stemmed from the fact that sales of service parts were more than double the 1941 total and the dealer had no excuse for trading away part of his commission in order to sell a new car.

Auto dealers had other profitable sources of revenue, too. Used cars were turned over at a substantial profit and the sale of new car accessories was undoubtedly at a higher rate per new car delivered than at any time in the history of the industry.

The dealers themselves maintained that the public's ideas about dealer profits were fantastic. The fact remains, however, that 1946 was a dealers' year in the automobile industry; labor had its wages clipped by rising prices and the motor car builders themselves, almost without exception, lost money until the last quarter when the combined effect of larger volume, higher prices and improved worker efficiency resulted in a small profit for a few producers.

Industry Loss in 1946

Based on preliminary financial reports for the first 9 months of 1946, the passenger car industry lost 0.196¢ on every dollar of sales after taking tax credits. Corresponding profit figures for previous years were:

1945	3.97¢	1941	6.45¢
1944	2.60¢	1940	7.07¢
1943	3.10¢	1939	8.25¢
1942	3.56¢		

Estimated loss for the passenger car makers for the first 9 months of 1946 was $5,493,046, after taking advantage of tax credits aggregating more than $130,000,000.

Behind the understandable disappointment of both motor car producers and the public with the 1946 production record lies the incontestable fact that both the industry and the public were asking more of the U. S. bank of raw materials than could be reasonably expected. Fig. 1 illustrates the lag in actual production as compared with output estimates made around VJ-Day. Instead of a trained and willing labor force the industry found it was dealing with a relatively untrained and restless labor group. At the same time all industry was trying to obtain unprecedented amounts of materials. With the lifting of government controls, prices shot unpredictably upward.

More specific reasons for the disappointing showing of the automobile industry in 1946 vary somewhat with the source of information. Management was inclined to point an accusing finger at the steel strike which cost 12 million tons of badly needed steel, at the coal stoppages in the spring and early December and at the rash of strikes throughout manufacturing and mining industries that surpassed anything thus far in the nation's history.

In May, for example, General Motors reported that 143 different strikes were simultaneously affecting production of its many divisions. These same strikes were also limiting the output of Ford, Chrysler, Studebaker, Nash, Hudson, Packard, Willys and many other secondary suppliers.

Fig. 2 describes chronologically the major production stoppages that hit motor assembly plants during 1946. Included in the chart are stoppages in car assemblies resulting from strikes in their own plants and those of suppliers as well as strikes in basic industries which affected automobile production.

Large Unbalanced Inventory

Confronted with the largest and most unbalanced inventories in its history, automobile producers turned to air express, air freight and railway express to keep assembly lines rolling. The industry brought to Michigan pig iron from Utah, Mexico and even Norway because it was well aware that the costliest step it could take was to shut down operations for lack of such items.

Ford offers an excellent example. As recently as November, unusual transportation costs were aggregating $30,000 per week. Everything from door handles to hubs and drums were being flown to widely separated plants.

Requiring 71,200 malleable castings daily to match a 4000 car production schedule, Ford found that big suppliers were able to furnish only 1000 castings each day. The balance had to come from many small foundries so that during November, Ford was actually buying malleable castings from 15 different suppliers. Much the same situation applied to a number of other parts.

Supply problems like those encountered during 1946 were unknown to the motor industry in the prewar period. With only a few day's stock during most of 1946 operations could seldom be carried out on predetemined schedules. Sources of supply and delivery dates were equally uncertain.

With steel in short supply in many of its forms, deviations from specifications were a necessary part of 1946 car production. When rear compartment striker plates originally made of castings were short, one manufacturer substituted forgings. Some producers used low alloy high tensile steels for trunk covers, engine hoods and other parts. The cost was high but the alloyed material was available and therefore used.

Because of the steel shortage, Fisher Body found it impossible to obtain steel of the proper size. On several occasions it was necessary to use roof stock for

a small body panel. In other emergencies, two pieces of scrap material had to be welded together to make a certain part. While such methods are expensive and entirely impractical in normal times, many automobile producers found it necessary to adopt such practices.

To simplify the production problems of spring manufacturers, Fisher Body engineers narrowed down its list of more than 100 types of springs. While this step required some engineering changes in seat construction, the move undoubtedly helped to alleviate a spring shortage which was chronic for several months.

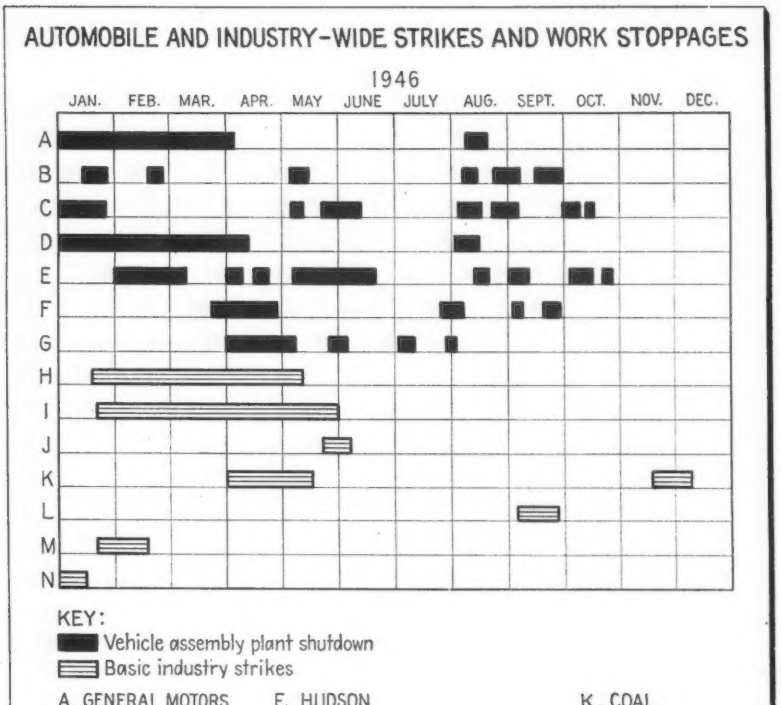


FIG. 2—Strikes and work stoppages in 1946 in the automobile industry and in industries supplying the automobile industry.

When the shortage of lead and tin threatened production, Fisher Body was able to eliminate one soldering operation and thus conserve on both materials. As a result of this change, the center pillar of the Fisher Body was redesigned. Instead of soldering and gas welding as was done previously, this member is now made by spot and arcwelding.

It is also reported that the tin content of solders used today by several body manufacturers has been reduced in some cases from a previous percentage of 15 to less than 3 pct. The amount of tin saved per car has been estimated at ½ lb. Bolts made of alloy steel were frequently used where plain carbon had previously been specified. Another change brought about by the steel shortage was the production of nuts and bolts on screw machines. These parts are normally made by cold upsetting.

Nearly all processing changes of this kind resulted in higher manufacturing costs and it was the pyramiding effect of many factors—deviations from specifications, higher prices for parts and raw materials, expensive stock chasing, more rigid inspection—together with the payment of higher wages and reduced worker productivity which led to the susbtantial increases in the prices of cars.

The selling price of automobiles was advanced during 1946 an average of 51.5 pct as compared with 1941 prices for the same models. Table I gives a detailed comparison of prices of popular models produced by the various manufacturers. Prices shown are for the standard four-door sedan delivered in the factory town. Factory list price, federal tax and dealer handling charge are included in the prices shown.

The basic economics prevailing in the automobile industry during 1946 are given in fig. 3 which shows the relative increase or decrease in employment, weekly manhours, hourly earnings, weekly payrolls, replacement parts, new cars produced and average prices of cars. The latest 1946 figures are contrasted in the chart with comparable figures for 1941 which was the last full year of automobile production. From these data it is apparent that the number of workers and weekly and hourly pay rates have outdistanced production and earnings by a wide margin. It should also be mentioned that the price increases shown seldom apply to a full year's output and that the largest price increases were made during November and December.

The highest production rate reached during the year was in October when 395,515 cars and trucks were built in the U. S. If even this rate could be maintained for an entire year, an annual output of 4,750,000 vehicles would result. With most plants known to be running at less than 80 pct of their present capacity this demonstrates conclusively that the auto industry has now converted its physical plant to a point where it could produce at a 5 million rate or better.

However desirable such output levels may be, this production must wait until the required materials again become available. It has been estimated that the following bill of materials is required by the automobile industry in a normal year:

In a normal prewar year the automobile industry used 7,500,000 gross tons of steel; 500,000 tons of malleable iron; 1,000,000 tons of gray iron castings; 20,000,000 tires for original equipment; and 120,000,000 sq ft of plate glass.

Other materials included 15,000,000 sq ft of upholstery leather; 20,000 tons of aluminum; 15,000 long tons of tin; 320,000 tons of lead and zinc; 20,000,000 lb of nickel; 750,000 bales of cotton; 500,000,000 bd ft of soft wood; 50,000,000 yd of cloth upholstery and 17,000,000 gal of paints and lacquers.

Labor relations continue to be the automobile industry's foremost problem. Following the General Motors' strike a wage pattern of 18¢ per hr increase was generally adopted throughout the automobile industry. Productivity of the automobile worker has been variously estimated at about 70 to 85 pct of the

prewar level. Accurate figures are difficult to obtain and workers' efficiency varies with each individual plant.

Absenteeism is considerably higher than prewar. During September the absentee rate for GM was 4.7 pct which means that one employe in 20 was absent every day. This factor alone would reduce a 40-hr week to 38 hr, and importantly influences the efficiency of plant operations.

In justification of its new wage demands, labor has argued that U. S. Bureau of Labor Statistics shows that the cost of living in Detroit has increased from 132.2 in March of this year to 148.7 in October, thereby virtually wiping out the earlier 18½¢ pay boost. The UAW-CIO has criticized the BLS figures as being too low to reflect actual increases in living costs. The UAW-CIO will ask from Chrysler Corp. a wage increase of 23 to 25¢ per hr. It is quite likely that an increase acceptable to Chrysler will have to be considerably less than this.

When all the factors in the present labor situation have been considered—about two-thirds of the workers lack previous experience, shortages of materials, difficulties in scheduling plant operations and the restlessness of the country generally and particularly returning veterans—it is difficult to see how worker productivity will be much improved unless labor saving equipment and incentive wage plans are introduced. At present, labor is vigorously opposing incentive plans and in many cases management has shown an almost equal lack of enthusiasm for tying pay and production together. Early in the year Kaiser-Frazer introduced a bonus plan which was acceptable to the union and offered workers $5 per car produced.

A prominent automobile supplier, Bundy Tubing Co. of Detroit, introduced a novel Labor Savings Sharing Plan which is reported to have improved worker productivity 35 pct and paid Bundy workers an average of 20¢ per hr in additional wages during the 6 months it has been in operation.

However, wage incentive plans were more the exception than the rule in the automobile industry during 1946 and both labor and management seemed reluctant to embark on any new pay scheme which related wages to the output of the worker.

In addition to direct wage increases, labor has indicated that other concessions to workers will be demanded in renewing labor contracts. Hospitalization paid for by the employer, old age pensions, a guaranteed annual wage and compensation for "walking time" are included in the latest UAW-CIO program. All new contracts containing these features must be acceptable to the international union as well as the local organization.

Steel requirements for a motor car have been a matter of conjecture for a number of years. While many figures have been published, the accuracy of the available data leaves much to be desired. For example the practice sometimes resorted to of dividing total steel sales in a given year by the number of cars produced

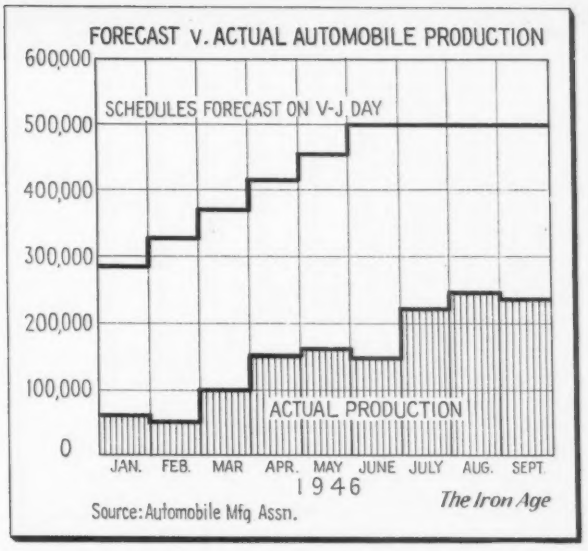


FIG. 1—Forecast of automobile production on VJ-Day as compared with actual production.

is open to question since motor car assemblies will seldom be in direct relation to steel deliveries. In addition, the amount of steel used for replacement parts must necessarily be considered.

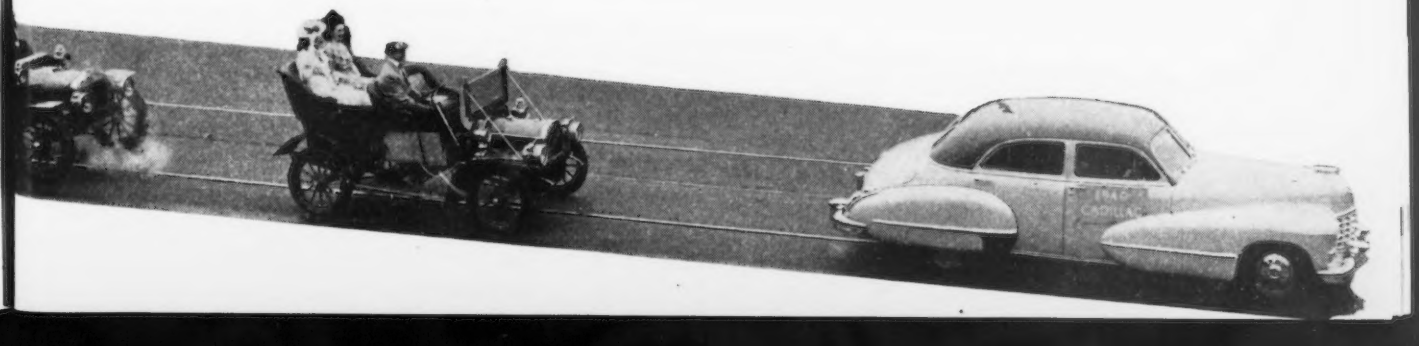
To determine the actual amount of steel purchased to produce a passenger car THE IRON AGE has obtained actual figures from the purchasing departments of several producers of low priced cars. The figures given are actual steel requirements of both the car company and its vendors broken down into cold-rolled sheet and strip, cold-drawn and hot-rolled carbon and alloy bars, terneplate and wire products.

As shown in table II, individual figures submitted by the several companies are in fair agreement. A composite figure for a typical low priced car has been added to permit a computation of annual steel requirements for passenger cars in any given year.

The largest single fact about the automobile industry in 1946 was the stubborn but unalterable obligation of producers to build as many cars as possible and sell them at a profit; designing new cars was and continues to be a secondary matter. With production costs climbing steadily, the industry is taking advantage of every opportunity to cut production costs. Many millions of dollars of planned expansion work has been cancelled during the past year, including the $20 million dollar GM research project and a $50 million Ford research development.

Chevrolet's plans for producing a light car were shelved during the past year and the latest blow fell when GM cancelled early in December a die program for 1948 Chevrolet, Oldsmobile and Pontiac cars. This move was made necessary, GM said, because of uncertainties in the labor and materials situation.

During 1946 the industry was selling all the cars it



could build with almost no selling effort, but it has its fingers crossed as to the number of cars it will sell in 1947 and 1948, even if prices remain at existing levels; some think prices will have to be increased still further, especially if further wage increases are granted.

While the date for introducing postwar cars seems to be retreating rather than advancing, some of the trends in design and engineering are becoming more apparent. Bodies are going to be wider and roomier; they will have more window area and be definitely more luxurious. Long tapering hoods are almost certain to disappear. Engines will be pushed forward to cradle the passengers between the wheels and provide better riding qualities.

Chromium plating, while costly, seems destined to stay (if for no other reason) because many automobile producers have millions tied up in new equipment that must be amortized.

Front seats are going to be wider and back seats will probably be narrower. The new Willys, for example, slated for production in late 1947, is designed to seat three passengers in front and two in the rear. The merging of fenders into body lines will continue and more running boards will disappear.

Improved vision, pioneered by Studebaker, seems certain to be adopted widely. There will be more legroom and headroom. The trend toward more attractive and more efficient operating mechanisms has been observed. Efficient air conditioning systems will soon be available in the higher priced cars.

Jet propulsion is impractical for motor cars, in the opinion of most engineers. Similarly, atomic power seems most unlikely unless better insulation against radiation is found. Engines will be greatly improved and friction will be reduced by improved bearings and better lubrication. Combustion chamber design will be changed and fuel distribution will be markedly improved. With shorter hoods, more compact engines will be required. Compression ratios are likely to go higher and the use of higher octane gasoline, alcohol and specially blended fuels will become possible.

Front wheel drive is costly but offers some advantages for clearing floor obstructions. Rear engine cars present difficult cooling, linkage control and weight distribution problems. In the low price field automatic transmissions will be made available at extra cost; such equipment will undoubtedly be standard in the medium and higher priced cars.

Front end spring suspension will be changed — probably radically. Willys has ready a four-wheel independent suspension, and other important developments in springing are reported to be well advanced. The high maintenance cost of coil spring suspension has been receiving well deserved attention by automotive engineers. Of all the engineering features of cars most likely to be changed, transmissions and springing seem to occupy the Nos. 1 and 2 positions.

Fully automatic infinitely variable transmissions are on the program of every automobile builder and a number of parts suppliers. Despite its relatively high cost, the

TABLE I

Comparison of Car Prices—1941-1946

Comparison of Advertised Delivered Price at Factory Town of 4-Door Sedan with Standard Equipment (Includes factory list price plus dealer handling charge and Federal Tax)

		1941 Announced (3½% EOH)	1946 (December) (7% EOH)	Pct Increase
Chevrolet	Stylemaster 6	$795	$1185	49.1
	Fleetmaster 6	851	1260	48.1
Pontiac	Torpedo 6	921	1407	52.8
	Torpedo 8	946	1435	51.7
	Streamliner 6	980	1486	51.6
	Streamliner 8	1005	1514	50.6
Olds	6-66	945	1451	53.5
	6-76 Std	1010	1544	52.9
	6-76 Deluxe	1090	1651	51.5
	8-78 Std	1045	1600	53.1
	8-78 Deluxe	1125	1706	51.6
	8-98	1135	1785	57.3
Buick	8-40 Special	1052	1556	47.9
	8-50 Super	1185	1798	51.7
	8-70 Roadmaster	1364	2083	52.7
Cadillac	V8-61	1445	2176	50.6
	V8-62	1585	2359	48.8
	V8-60 Special	2195	3099	41.2
	V8-75	2995	4298	43.5
Hudson	Super Six 51	1006	1555	54.6
	Commodore Six 52	1087	1698	56.2
	Super Eight 53	*	1667	*
	Commodore Eight 54	1132	1774	56.5
Ford	Deluxe 6	797	1198	50.4
	Super Deluxe 6	843	1273	51.1
	Deluxe 8	813	1248	53.6
	Super Deluxe 8	859	1322	54.1
	Mercury	987	1509	53.1
	Lincoln	1490	2337	56.8
Studebaker	Champion	860	1373	59.9
	Commander	1130	1634	44.8
Nash	600	810	1298	60.1
	Ambassador	980	1564	59.5
Packard	6 Touring Sedan	1286	1730	34.5
	Deluxe Clipper Tour Sedan	1396	1869	33.8
	Super Clipper Tour Sedan	1739	2290	31.6
	Super Clipper Club Sedan	1678	2241	33.5
Chrysler*	Not Available on a Comparable Basis Unweighted Average Price Increase			51.5
Kaiser-Special		....	1859	....
Frazer		....	2044	....

* Chrysler prices *not* including transportation, delivery and handling, federal or local taxes as follows: Plymouth Deluxe, $1150; Plymouth Special Deluxe, $1225; Dodge Deluxe, $1325; Dodge Custom Deluxe, $1375; DeSoto Deluxe, $1445; DeSoto Custom Deluxe, $1495; Chrysler Royale, $1545; Chrysler Windsor, $1595; Chrysler New Yorker, $1945; Chrysler Town and Country, $2350.

Olds hydromatic transmission has found wide public acceptance. The broad engineering problem is to produce an infinitely variable transmission at a cost low enough to permit its use on all makes of cars, regardless of price. Whether the final mechanism will take the form of a torque converter (such as that being used on GM buses) or an overdrive or some equally ingenious device cannot be determined at the present time. Indications are, however, that automatic transmissions will be included on all medium and high priced 1948 model cars. Moreover, if production experience is favorable from a cost standpoint, low priced cars will also be so equipped. The amount of engineering effort being directed in this field indicates that successful infinitely variable automobile transmissions are hardly more than 2 yr away.

The various auto manufacturers are discreetly silent as usual about specific engineering changes to be incorporated in their postwar cars. Many new engineering developments are looked for from the greatly strengthened engineering department of the Ford Motor Co. Ford's six-cylinder engine is reported to be well into the final test stage. The Ford Mercury line will undoubtedly undergo important engineering changes and the Lincoln is expected to become a pacemaker among the luxury cars, incorporating all the engineering advantages that can be featured in a high-priced car.

As the first postwar car, Studebaker has received well-deserved and favorable attention as a pathfinder in new body styling. Unfortunately, with only a limited amount of materials available, Studebaker has not been able to take full advantage of its advanced styling. Packard is reported to be tooled for a new car that is "new from the tires up."

The Tucker, incorporating hydraulic torque converters and a direct power transmitting system that eliminates the clutch, transmission, drive shaft, differential and rear axle, offers an example of what might be done to a motor car by a new producer who is unfettered by engineering tradition or expensive dies. Other features of the Tucker Torpedo include engine in the rear, individual suspension on all four wheels, front fenders that turn with the wheels, integrated body and chassis utilizing steel tubing construction to give strength and stiffness. The Tucker power plant is six cylinder opposed with fuel injection rather than carburetion.

Five Million Cars?

With respect to 1947 models, Olds will introduce its new "face-lifted" models early in January and other producers are expected to follow suit at intervals but with minimum interruption to production to permit the changeover. In no case will the change be extensive and investments in new dies will be at a minimum.

One prominent economist in the automobile industry is predicting the production of 4,500,000 new passenger cars and 1,200,000 trucks in 1947. This forecast assumes, of course, that the materials will be available, that no serious strikes will occur, and that prices will not be raised to higher levels. It also assumes that much needed additional steel capacity will become available in June. According to this particular economist, the buying power for a 5-million car year at present prices is still available. Other forecasts are less optimistic, holding to the view that existing car prices and the troubled labor situation will hardly permit a 5-million car year in 1947.

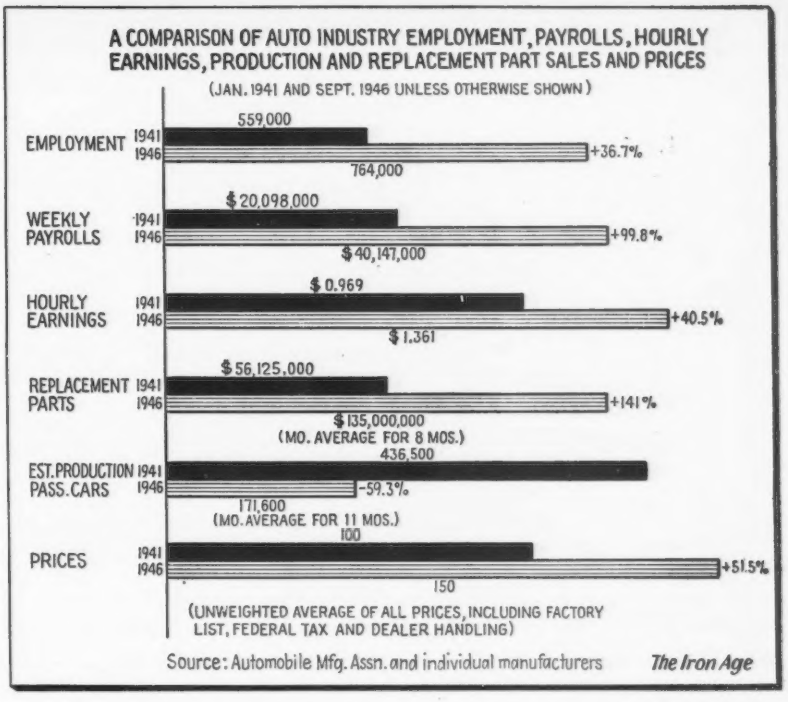

A COMPARISON OF AUTO INDUSTRY EMPLOYMENT, PAYROLLS, HOURLY EARNINGS, PRODUCTION AND REPLACEMENT PART SALES AND PRICES
(JAN. 1941 AND SEPT. 1946 UNLESS OTHERWISE SHOWN)
EMPLOYMENT 1941 559,000
1946 764,000 +36.7%
WEEKLY PAYROLLS 1941 $20,098,000
1946 $40,147,000 +99.8%
HOURLY EARNINGS 1941 $0.969
1946 $1.361 +40.5%
REPLACEMENT PARTS 1941 $56,125,000
1946 $135,000,000 (MO. AVERAGE FOR 8 MOS.) +141%
EST. PRODUCTION PASS. CARS 1941 436,500
1946 171,600 (MO. AVERAGE FOR 11 MOS.) -59.3%
PRICES 1941 100
1946 150 +51.5%
(UNWEIGHTED AVERAGE OF ALL PRICES, INCLUDING FACTORY LIST, FEDERAL TAX AND DEALER HANDLING)
Source: Automobile Mfg. Assn. and individual manufacturers
The Iron Age

FIG. 3—Employment, payrolls and hourly earnings in the automobile industry, compared with car prices, production and part sales.

A Good Production Year

In any event, the need for at least 5 million cars to bolster a badly deteriorated transportation system is generally accepted. The $64 question will be therefore: Will the raw materials, the price levels and buying power permit the marketing of 5 million or more cars? The fact that most auto producers are now concentrating solely on the production of as many cars as possible and not on new models, ought to increase the industry's chances for a good production year.

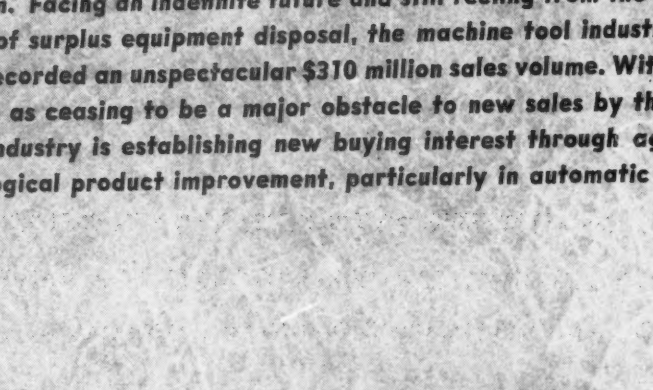
TABLE II
Automobile Steel Requirements
Pounds of Steel Purchased for Several Passenger Cars in the Low Priced Field

	Car A (lb)	Car B (lb)	Car C (lb)	Typical Low-Priced Car (lb)
Sheets and Strip				
Cold-Rolled	1122.8	1083.4	1024.2	1075
Hot-Rolled	659.3	649.0	685.0	665
Total	1782.1	1732.4	1709.2	1740
Carbon and Alloy Bars				
Hot-Rolled	436.1	*	428.1	430
Cold-Drawn	43.6	*	35	40
Total	479.7		463	470
Long Terne Sheet	18.4	23.6	25.4	23
Wire Products	130.0	*	125.4	127
Miscellaneous	4.0	*	81.3	50
Total	2414.2		2405.0	2410

* Not available.

MACHINE TOOLS

The nation's prince or pauper industry in 1946 found itself neither patrician nor plebeian. Facing an indefinite future and still reeling from the suffocating effects of surplus equipment disposal, the machine tool industry in the past year recorded an unspectacular $310 million sales volume. With surplus selling seen as ceasing to be a major obstacle to new sales by the end of 1947, the industry is establishing new buying interest through aggressive technological product improvement, particularly in automatic units.



BY H. E. LINSLEY
Machine Tool Editor,
THE IRON AGE

NEVER has any industry been faced with so difficult a situation as that which confronted the machine tool builders with the ending of the war. For 4 yr they had poured forth their treasure of engineering skill and productive experience in unstinting measure, manufacturing in some cases as much equipment as in 40 preceding years, and knowing that in so doing they were deliberately destroying their potential postwar market. Numbering only some 200 units, none of which could by any stretch of imagination be classified as industrial giants, they nevertheless managed to supply all the needs of fantastically swollen war industries at home and, in addition, furnished sorely needed equipment to allied governments. To paraphrase Churchill, it may truly be said that never in the course of American industry have so few produced so much with so little.

Of course there were profits; even privates and generals do not fight for love and glory; but rarely if ever were those profits out of proportion to the investment and effort involved. Nor were those profits permitted to be set aside as insurance against the evil days ahead. Rather they were branded excess, and almost in their entirety ordered turned back in taxes. The individual worker was consistently urged to save a portion of his suddenly expanded income by investing it in war bonds, so that when the anticipated rainy days arrive he might have funds available to carry him through to better times. Only in this way, it was said, could the nation's surplus buying power be stored up and the perils of inflation be avoided.

The manufacturer, however, was in a different case. He, according to New Deal philosophy, would have no need for such insurance. If his machines were worn out, if his factory needed repairs or rebuilding, the cost would have to come out of his then current income, however small that might be. For him, presumably, the skies were to be always blue.

Despite these drawbacks the omens early in 1946 seemed to indicate a comfortably prosperous year ahead. New models were out of the design stage and about ready for production, models which were sufficiently advanced over their predecessors to warrant the assumption that they would find a ready sale in spite of the threat of surplus equipment. Would-be buyers of surplus were becoming so disgusted with the red tape and various shenanigans involved in the purchasing of a surplus machine that, in many cases, they were giving up all hope of success and were looking to the manufacturer to furnish new equipment. Then came the strikes!

The copper strike was curiously unspectacular and the general public was hardly aware that it existed, but it worked havoc with the makers of electric motors, controls, and switchgear. When the motor makers themselves struck, the situation became desperate indeed. Machines piled up on the assembly floors, ready for shipment, but lacking electrical equipment. In a few cases they were shipped with secondhand motors, with the understanding that these would be replaced when new ones became available. Some were fitted with the customer's own motor, but these were only stop-gap methods as the supply of such equipment was necessarily limited. This situation lasted throughout the greater part of the year and it was only during the closing months that any real relief was experienced.

Antifriction bearings were another bottleneck. The higher speeds and greater precision demanded in the new machines have resulted in a much wider application of this type of bearing and early in the year some plants were obliged to close down because of the short supply. The situation eased somewhat during the last quarter but is still far from satisfactory. With five major items—castings, bearings, motors, electrical equipment and carbon steel—all in short supply it is hardly surprising that deliveries have been on an "if, as, and when" basis throughout the year.

The steel strike early in the year put a decided crimp in production, although its full effects were not felt for several weeks since most builders had fair stocks on hand. The first coal strike, however, was more serious. The time interval between the steel and coal strikes had been so short that almost everyone had been existing on a hand-to-mouth basis, and stocks of steel were down to a dangerously low ebb. This second shutting off of steel supplies forced some builders to close down altogether, while others cut operations to 1 or 2 days a week. Even after the settling of this strike it was impossible to build up any real reserves. So great was the pent up demand for steel that even when operating at or near full capacity the mills could not fulfill it. Consequently, when the second coal strike was called, few manufacturers had more than a few days' supplies on hand.

Within the machine tool industry itself strikes have been fairly numerous, but they have been for the most part of short duration and restricted to individual plants, so that while production in some plants has suffered, the effect on the industry as a whole has not been serious.

Reported shipments of machine tools for the month of January amounted to some $28 million, and were slightly less than the new orders received. Backlogs at that time were little more than $178 million. From that point on, as shown in fig. 1, shipments held fairly steady to an average of about $25 million with the exception of a low spot of $20 million in July. The July drop can be attributed chiefly to the normal seasonal decline, since August saw a distinct recovery. It was at the end of July that price controls were lifted on most items but this appears to have had little or no effect on new orders. Since any sharp price increase must inevitably have caused at least a temporary re-

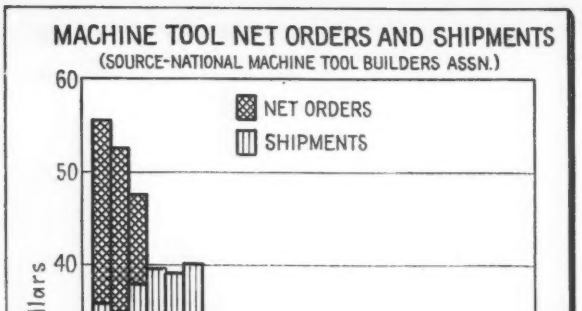


FIG. 1—Net orders placed during the year climbed to a high of $31 million in April, declining thereafter to bring the year's average to $25 million. Shipments for the most part held fairly close to orders.

cession in buying, this is clear evidence that the builders have declined to take advantage of the inflationary spiral. This situation closely parallels that of the month of April when a 20 pct increase in price ceilings was granted. At that time, much of the OPA's amazement builders declined to effectuate a general 20 pct increase, applying it only to those items which were being produced at a loss.

For the first 10 months the average net new orders ran close to $24¾ million, or somewhat lower than the anticipated $30 million. This was lower than the average for the corresponding 10 months of 1945, although this latter figure was substantially increased by heavy ordering in the first 3 months.

The leveling off tendency, evident since the end of the last quarter of 1945, would lend credence to the general belief that for the most part the reconversion period is at an end and most plants are now fully equipped for their prewar lines, or have tooled up for their new postwar products. It seems doubtful, therefore, whether there will be any pronounced upward swing, and indeed the market may go still lower before it reaches its new postwar norm.

Some of the drop in net orders may also be due to the unsettled conditions of industry in general, and to the fact that the automobile industry has not been able to decide definitely on its tooling program for the coming year. Should conditions improve to the point where full scale production of the 1948 models appears possible, orders during next year may show a definite improvement. The ending of the coal strike and the probability of antistrike legislation seem to offer some hope of an overall resumption of production, but there is no doubt that the severe shortages already created will plague everyone for some months to come. The trend of unfilled orders and cancellations in 1945 and 1946 is shown in figs. 2 and 3.

Several machine tool builders have branched out into completely new and different lines in a effort to make better use of expanded facilities and to even out the production peaks and valleys. Textile machinery, paper milk bottle making machines, farm, garden and road building equipment are but a few of the new lines now being manufactured by machine tool builders. In at least one case a builder is producing small hand tools for a mail order house in astronomical quantities, while others are accepting production orders for a wide variety of parts on a subcontracting basis.

About the only plants to reap any benefit from the rising wage scales have been the builders of special purpose equipment. Most of these have been booked to capacity throughout the year and show no signs of any slackening for at least a year to come. Confronted with the double barreled threat of increased wages and lower output per man, manufacturers everywhere are putting into practice the lessons learned during the war period and are demanding machines that will give higher output per man without increasing the physical labor involved.

Objections have been raised to this type of equipment on the grounds that it is useless to buy a high production machine if the operators refuse to allow it to work at full capacity. And there have been cases in which, unable to reduce the productive rate of the machines, operators have shut them down after a specified number of parts have been produced. Such actions have invariably been seized upon as concrete examples of labor's unwillingness to work, but there is, nevertheless, something to be said on labor's behalf. If the operator can see an endless stream of parts flowing to him and can feel certain that he will still be working next week, next month, and next year, there is little doubt that he will allow his machine to work at its maximum capacity for the full working day. If on the other hand his supply of parts is strictly limited, for whatever the reason, it is only natural that, being but human he will endeavor to stretch out the job and postpone the threatened layoff.

To a large extent the building of special equipment has been in the hands of a relatively small group, but the past year has seen many manufacturers of standard equipment redesigning their product to include automatic and semiautomatic features. Lathe builders in particular have been outstanding in this regard. Many of the new lathes incorporate electronic and hydraulic operation and pushbutton control, together with a degree of simplicity and automaticity found hitherto in only the most strictly special machines. Perhaps the impact of the huge number of standard lathes declared surplus may have been a factor in accelerating this development, but it is nevertheless an indication of the design trend that is spreading rapidly throughout the entire machine tool industry.

Foreign Business

Throughout the year foreign business has been much in evidence, with substantially more than two thirds of the manufacturers engaged in it. No exact information is available as to the origin of these foreign orders, but it is known that Russia, France and Latin America have been heavy buyers. Like domestic orders the volume has declined steadily, but over the first 9 months an average of 27 pct of all new orders have been from foreign sources. Foreign shipments appear to have lagged somewhat behind orders, and of

the present backlog of unfilled firm orders 29 pct is for foreign delivery .

Exports to Britain have fallen sharply, as was expected, in the line of standard machines, and even special purpose equipment normally obtained from the U. S. is now being built in Britain both for domestic use and for export. In the European markets especially, Britain is making a strong bid to capture a substantial part of the machine tool business. British wages, together with lower shipping costs, and the fact that Britain has adopted a policy of exporting, regardless of domestic needs, would indicate that British machine tool prices should be substantially lower than those of equivalent American machines. This does not, however, appear to be the case, and reports from Europe indicate that foreign prices in general are about equivalent to American prices with Swiss machines running some 10 pct higher.

German machine tools are supposed to form an important item of reparations, but since the greater part of these are located in the Russian zone and have by this time undoubtedly vanished over the Urals, it is questionable whether anything more than a very thin trickle will ever reach the factories of France and the other allied nations. In any event, manufacturers in those countries cannot afford to wait, and if they are ever to recover from the appalling state in which they now exist, they must have tools now.

Italy, oddly enough, appears to have been devoting considerable effort to the machine tool business and large quantities of machines are said to be available. Information as to quality and price is not available, and while there is no reason why these should not both be excellent, it is doubtful whether they will ever offer a serious threat to either American or British products.

Australia, which before the war was dependent almost entirely upon imports for her machine requirements, has now become virtually self-supporting and is even entering the export market. Shipping difficulties made it impossible for her to obtain the vast number of machines needed for war production and resulted in almost an overnight establishment of a substantial machine tool industry. The success of this may be judged by the fact that out of 52,000 machine tools being operated in 1945, only 7000 were imported from the U. S. and 5000 from Britain, the remaining 40,000 being of local manufacture. The value of these machines is estimated at over $100 million, while tools and gages to be used in conjunction with them were produced to the value of $36 million. Tool and die shops increased in number from 2 in 1939 to 188 at present, and machine tool shops from 6 to 200, and

TABLE I

WAA and Private Industry Sales of Machine Tools

Month	War Assets Administration Sales			Machine Tool Industry Shipments
	Original Cost	Recovery	Percent Recovery	Total Shipments
1946—January	$20,135,000	$9,491,000	47.1	$30,200,000
February	19,416,000	9,313,000	48.0	26,900,000
March	40,082,000	19,264,000	48.1	27,300,000
April	29,570,000	13,614,000	46.0	28,100,000
May	30,757,000	14,415,000	46.9	26,500,000
June	46,508,000	21,940,000	47.2	26,500,000

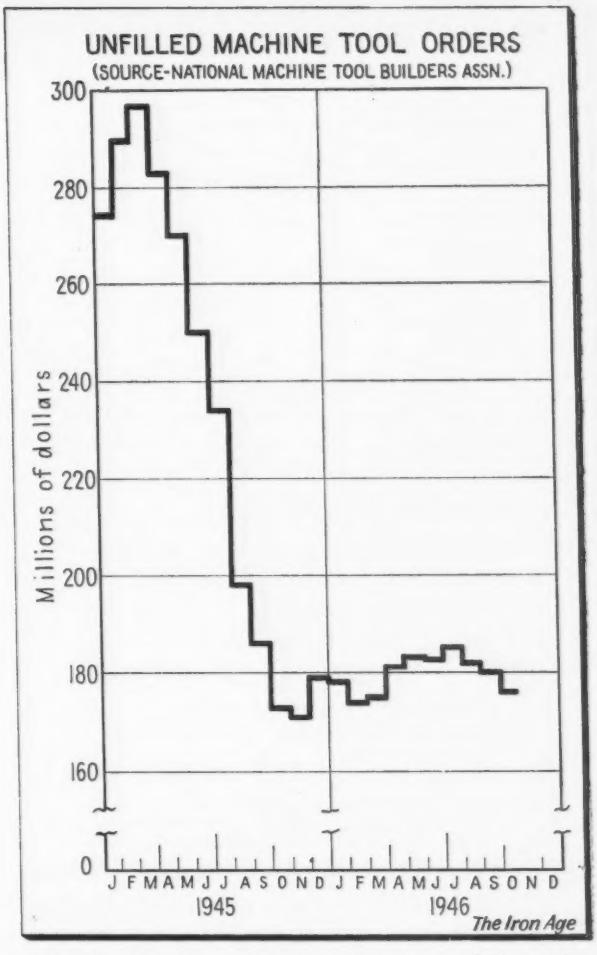


FIG. 2—That the machine tool industry as a whole is still in a fairly strong position is evidenced by the fact that the existing backlog of orders is sufficient to insure almost a year's operations at present levels.

although enormous strides are being made in the manufacture of agricultural, road building and other machinery, it is unlikely that all these plants can remain long in production unless a very lively export trade can be created. It may be many a long year before Australian-built machine tools appear in American plants, but the products of those tools may shortly be offering real competition in South America and the Pacific area.

War Surplus

Of all the problems that have faced the machine tool industry during the past year, and they have been many, the worst has undoubtedly been that of surplus equipment. As of Dec. 31, 1945, surplus machines actually in government warehouses amounted to $518 million and there was an estimated additional $495 million still outstanding in plant inventories. And up to that time the total sales had accounted for only about $81 million. It was obvious that if this tremendous volume of machinery was to be effectively transmuted from surplus into actively producing equipment, a tremendous selling job would have to be done. The establishment of dealer-agencies to increase the number of outlets was a logical move, but although certain qualifications were specified, more than 3000 licenses were granted, many of them to hastily organized firms which lacked the proper experi-

ence to guide effectively the selection of equipment to meet the customer's needs. Geographical distribution of agencies seems to have received little attention, with the result that some areas are overcrowded, while others are inadequately covered.

On the whole the dealer plan has been successful, and by August of last year it was estimated that agents were accounting for 65 pct of all surplus machine tool sales. This was not achieved without considerable difficulty, and at one time it looked as though the entire program would collapse. The 12½ pct commission due on each sale, and payable directly by WAA, failed to materialize in many cases and dealers were obliged to wait sometimes as long as 8 months before collecting it. The situation was further complicated by the raising of the question as to whether

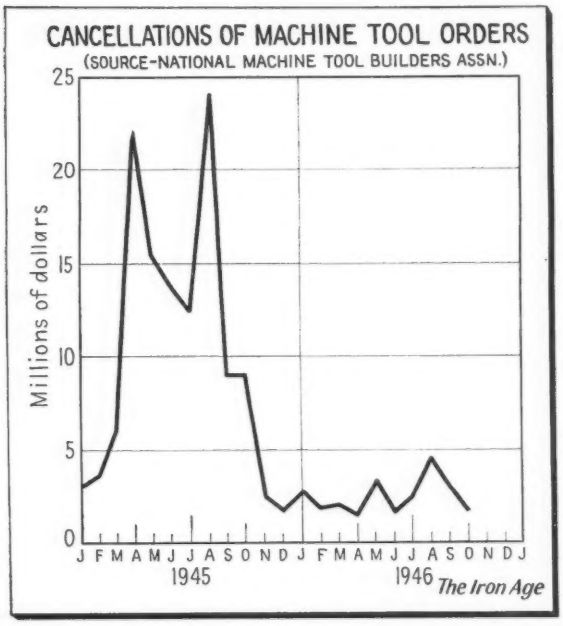


FIG. 3—Plummeting from the peak of $24 million in August 1945, cancellations hit a low of $1½ million in June 1946. Removal of controls in July was reflected in a climb to $4½ million in August.

dealers could continue to operate without taking out a pawnbroker's license. The final straw came when Comptroller General Lindsay Warren made the ruling that WAA lacked the authority to pay commissions. Dealer contracts made prior to March 25, when WAA was established, were held to be valid insofar as the receiving of commissions was concerned, since they had been executed by RFC or WAC which were empowered to make commission payments by reason of their corporate structures. WAA, on the other hand, was established as an administrative unit, and was held to be without such authority. Fortunately, however, this situation was straightened out after a brief delay, although it did not do much towards strengthening the confidence of dealers.

The commission situation still continued, however, to be a vexed question. Dealers who had gone to a great deal of trouble to locate some particular machine for a customer, and had effected the sale, were apt to find that in the meantime the customer had obtained a priority in an effort to get faster action, and as a result the dealer was deprived of commission, since this is not payable on priority sales. Similarly, sales made to another dealer, even though the machine was for the latter's own use, were exempt from commission.

Widespread complaints were made against the manner in which affairs were handled in WAA offices, and charges of graft and collusion were freely made. That these were not without foundation was shown by the investigation conducted in the Cleveland office, where definite evidence of graft was uncovered. Among other things it was charged that some machines were sold, for a consideration, before they had actually been declared as surplus. Others were sold as scrap, only to reappear in first-rate condition on the used machine market at normal used prices. In still other cases priority records and other paper work on particularly desirable machines are said to have been destroyed or deliberately lost so that the machine might be sold to some other favored buyer. Even in cases where no corruption existed, there were many cases in which records were so mishandled that by the time the paper work for a certain machine had been cleared, the machine had already been sold to someone else, or some part of the essential records had disappeared and the sale could not be effected.

Despite all these troubles and vexations, however, the sales of surplus continued to grow as deliveries on new machines were more and more extended by strikes and shortages. As shown in table I, covering the first 6 months, these amounted to more than $88 million in actual receipts for machines having an original cost of about $186½ million, or a return of better than 47 pct. This is an exceptionally high figure for surplus equipment sales and is in sharp contrast with the return realized on most other goods.

The inauguration of the site sale, about the middle of the year, gave new impetus to the disposal movement, although this was not without its troubles, due to the lack of training and experience of WAA personnel. Why young, completely green men should have been given responsibility for the handling of such highly specialized equipment as machine tools is, and probably will remain, a complete mystery. Older men who had spent a lifetime in the business were available, having been released from their production duties by the very fact that the machines they had had under their supervision were declared surplus. Yet these men were allowed to pass into retirement, or to seek other employment, without any attempt being made to apply their skill and experience to the classifying and selling of the surplus machines.

Increasing age, under the Clayton formula, and steadily falling prices were other factors tending to step up the rate of disposal, but by early fall it began to appear that the best of the surplus had been well picked over. It was then that rumors began to circulate concerning a proposed drastic cut in prices, but the most persistent inquiries were met with denials or professed ignorance from Washington officialdom. Since such an action could be expected to have immediate repercussions on the entire machine tool market, it was to be expected that the Metalworking Equipment Industry Advisory Committee would be consulted in advance. It came as a most unpleasant shock, therefore, when, without any warning, War Assets Administrator Littlejohn suddenly announced a new pricing program which removed 60 to 70 pct of all government-owned machine tools from Clayton formula regulation, and placed about $350 million of machines

on immediate sale at fixed prices. Opinion as to the effects of this move was sharply divided among dealers and builders. Some builders agreed that cutting the prices of those machines in long supply would not only depress still further the market for new tools, but would discourage buying from surplus. It was felt also that the new low prices, averaging about 20¢ on the dollar, would definitely encourage speculative buying and that legitimate dealers could not afford to sell at these prices with only 12½ pct commission.

Regardless of all protests, however, the new prices have held, and latest figures indicate a substantial increase in sales. Some of the items offered in considerable numbers are still stock items with builders and are still in their original shipping crates. Whether this will cause a break in new machine prices is still to be seen. Theoretically, of course, all machines so offered are in long supply, but the fixed price lists contain numerous items previously considered unobtainable at any price. What the cumulative effect of this price cut will be has not yet appeared, and in view of the divergence of opinion it might seem that Littlejohn took Admiral Farragut's advice and went ahead.

From the standpoint of national security, one extremely serious weakness has appeared in the surplus disposal program. That is the failure to set aside an adequate strategic reserve of those machines most urgently needed in time of war. Immediately following VJ-Day, the Navy managed to preempt a few machines, although not nearly the number it could use. The Army and Air Force, however, delayed action, and then found that any machines they needed would have to be purchased at full price. Since they lacked funds for this purpose, the machines naturally passed into the civilian market. It is true that at the end of November some progress was being made to establish a standby pool of some 60,000 machines. Of these the Navy Bureau of Aeronautics proposed to take about 16,000, the AAF about 24,000 and the Army Ordnance about 19,000. This would have been sound thinking a year ago, but by this time the supply is pretty well picked over, and the best machines, which are frequently the most difficult to obtain in an emergency, have already gone. Moreover, regulations forbid the reservation of any machine necessary to reconversion. Under these circumstances it is doubtful whether the required number of machines can even be located, much less purchased. This is locking the stable door with a vengeance. Draft legislation may succeed in maintaining a substantial peacetime army and navy, private enterprise may continue to develop new types of aircraft, but with her war potential, in the form of production equipment, smashed beyond repair, America will no longer appear as a serious threat to any nation bent upon world conquest.

Equally serious has been the failure to make available to the schools badly needed machines for training purposes. Engineering and vocational students, with very few exceptions, are being trained on machines so hopelessly outmoded that only in basic principles do they in any way resemble present day counterparts. Only in mid-October was it announced that schools could obtain surplus machines at approximately 95 pct discount. The cost to the schools will therefore be insignificant, but the chances are that the cost of collecting the 5 pct, with all the multiple-copy paper work involved, will be more than the return. It would be cheaper to ship them free, freight charges collect, upon receipt of application from properly accredited schools, and to charge off the cost to national education. Even such a gesture as this may fail in its objective, since here again the best machines have gone. Nevertheless, it would help to reduce supplies, and if the WAA is as anxious as it claims to be to sell out and shut up shop, this would be a step in the right direction.

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IN an effort to facilitate sales of surplus equipment, WAA experimented with departmentalizing the entrances to the Linden, N. J., tool depot. Here are some priority holders inspecting lathes.

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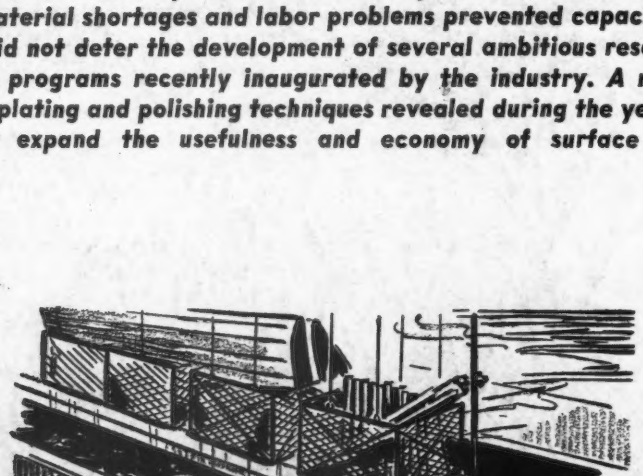
METAL FINISHING

A productive but difficult year was recorded by the metal finishing industry in 1946. Material shortages and labor problems prevented capacity operations but did not deter the development of several ambitious research and apprentice programs recently inaugurated by the industry. A number of significant plating and polishing techniques revealed during the year served to further expand the usefulness and economy of surface finishing.



By ADOLPH BREGMAN
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FROM an economic point of view, 1946 was a difficult year. The metal finishing plants, by and large, have been busy; as busy as the shortages of labor and materials have permitted. But the road has not been smooth, nor, on the whole, very profitable. Shortage of skilled labor, reduced output per manhour, shortages of materials and rising costs of both labor and materials have all contributed to the anxieties of the plant operator. Almost all government restrictions have been removed, but markets, although technically "free," became more, instead of less, restricted and in some instances, almost chaotic. This condition was, of course, aggravated by the plague of strikes which afflicted all industry.

The records of the Masters' Electro-Plating Assn. of New York may be taken as an index. The rate of operations among the members of the association for December 1945 was 70½ pct of capacity and for the first half of January 1946 was 66 pct, compared with 71 pct in December 1944, and 71 pct in January 1945. Business at that time seemed to be in a decline. By the end of 1946, however, it had risen to over 80 pct. Prices for work were not glittering, but not bad. The worst problem, however, was that the shops were not getting a fair return in work from their employees, per dollar of payroll expended.

Costume Jewelry Declines

There was one exception to the general trend. Costume jewelry, an important field for electroplating activities, is declining. The reasons for the decline are varied; possibly overproduction, possibly too high prices, and possibly also, the normal turn of events, including changes in fashion, etc.

During the past year OPA Maximum Price Regulation No. 581 was liberally amended as of July 25, 1946, and electroplating and metal finishing were decontrolled.

The outlook for supplies is still poor, as the following summary shows:

Copper—wire very scarce
Alkalis—no improvement
Cadmium—getting worse
Lead—restricted
Tin—slight improvement
Vapor degreasers—getting worse
Acids—very tight
Acme white—supplies going fast
Tripoli—getting worse; tallow short
Buffs—as bad as ever

According to information from the CPA, cadmium is still critical and no change for the better is expected in the future. Strikes in the mines and smelters of the producers have been settled, but the demand is still far beyond the available supply. Zinc, however, is in comparatively good supply. Platers are, therefore, advised to switch their customers from cadmium to zinc wherever possible.

An interesting development of the past year was the formation of the National Assn. of Metal Finishers, Inc., a nation-wide organization of job platers to consolidate and coordinate the various local organizations already existing in several of the largest centers. Plans are going forward to organize new local associations in sections where none exist at this time. Full information can be obtained from R. M. Shock, secretary, Dime Bldg., Detroit.

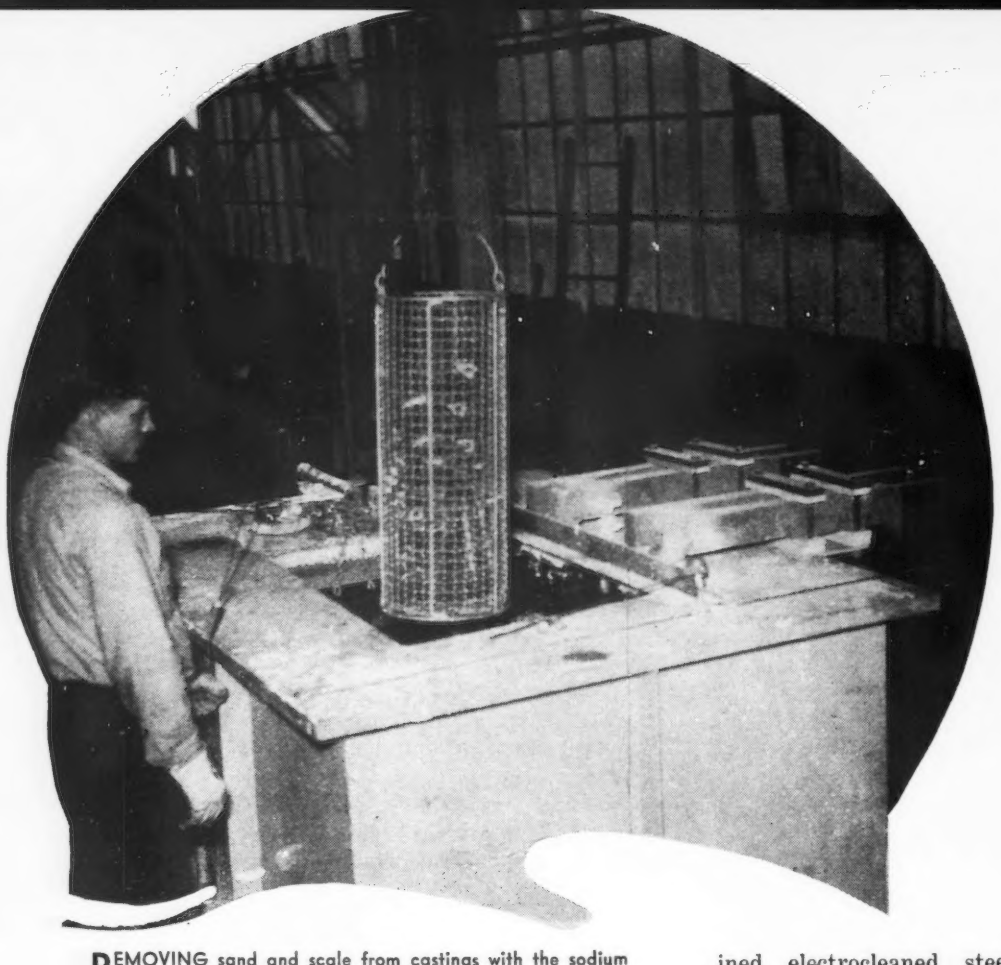
A Polishing and Plating Apprentice Training Program has been initiated by the Masters' Electro-Plating Assn. of New York in cooperation with the U. S. Department of Labor and the New York State Apprenticeship Council. The purpose is to build up a body of skilled workers for the industry and to provide Veterans with training and education in these skilled trades.

Technical Developments

The most important technical development in buffing in years was the use of spray equipment with liquid polishes, giving a production method for spraying buffing compositions onto the buffing wheel. "Spray Tripoli" consists of the standard Tripoli abrasive powder suspended in a liquid grease or oil-base binder. The fluid composition is fed to a spray gun mounted above the buffing wheel in a convenient position. The liquid composition is sprayed, by air pressure, onto the buffing wheel as requred. The advantages of this process are: (1) The buff is always coated with the optimum amount of composition; (2) work with either an excess or deficiency of composition wears out buffs more rapidly. Using spray compositions excessive buff wear is eliminated; (3) excessive bar composition on the wheel generally packs solid buffing dirt in the crevices of the article, necessitating a difficult cleaning operation. With the spray method, residual dirt is at a minimum and easily cleaned; (4) savings of 50 pct or more in composition, it is reported, may be effected by the spray method, and (5) fire hazard of conventional buffing on muslin wheels with a deficiency of composition is eliminated.

An important improvement in metal finishing was the use of the tumbling barrel for deburring. Parts are tumbled in sectional barrels with abrasives, and burrs removed in a fraction of the time formerly required, at greatly reduced cost. Precision-made parts may be finished without materially altering critical dimensions.

A marked advance in gold plating was the proposed commercial standard for marking gold-plated articles, put forth by the Jewelers' Vigilance Committee, the New England Manufacturing Jewelers and Silversmiths' Assn. and the National Bureau of Standards, calling for a minimum deposit of 0.000007 in. of gold on significant surfaces. This standard has been criticized by some costume jewelry manufacturers who state that it does not reflect industry practice; that a large proportion of the inexpensive gold plate is below



REMOVING sand and scale from castings with the sodium hydride process.

this minimum figure. This standard has not yet been put into effect.

Research is constantly receiving more attention from the metal finishing industry. Following is a summary of the most important projects now in motion The American Electroplaters' Society has initiated a number of research projects, as (1) stripping of copper; (2) analytical methods; (3) methods for testing adhesion; (4) effect of surface finishing of nonferrous base metals in relation to the protective value of electroplated coatings; (5) effect of impurities and their removal from plating solutions; (6) nature and effect of porosity in electrodeposits; (7) polarization of electrodes, and (8) physical properties of electrodeposits.

ASTM Committee B-3 on corrosion of nonferrous metals and alloys has submitted, tentatively, a method of salt spray (fog) testing, designated as B17-44T. Committee B-8 on electrodeposited metallic coatings is conducting exposure tests of lead coatings on copper and steel; it is also working on changed specifications for electrodeposited coatings including nickel and chromium plates. Committee D-12 has recommended standard methods for chemical analysis of industrial metal cleaning compositions. Section G of this committee is actively working on metal cleaning problems. Their primary interest at this time is the evaluation of all available information, with the object, ultimately, of furnishing methods and specifications for the industry.

An evaluation of surface-active agents was discussed in detail by Jay C. Harris. Reduced to fundamentals, evaluation of a surface-active agent should follow these lines: Determination of properties; evaluation under simulated practical conditions; test in actual operation.

A quantitative method for performance evaluation of alkaline metal cleaners was described and discussed by Samuel Spring, Howard I. Forman and Louise F. Peale. The method involved coating metal panels with various oils by a specific dipping and drainage technique, followed by a carefully controlled cleaning and rinsing procedure. The panels were covered with a fine spray of water, which condenses as droplets on the oil-covered areas, providing a pattern that remains constant for a sufficient time for a sketch to be drawn on paper divided into 100 squares. The average value for cleaned area of five panels is the cleaning efficiency index.

Smith and Karle examined electrocleaned steel by electron diffraction methods and found that a so-called "clean" metal surface is coated with a film of a chemical compound of the base metal or of the elements in the cleaning solution.

Acidic atmosphere evaluation of cleaning on the corrosion of steel was discussed by Chester W. Smith. An "acidic atmosphere cell" was devised which produced a type of corrosion similar to that encountered in actual exposure: moisture, acidic gases, oxygen, temperature variations, etc. This cell was used as a means of evaluating different cleaning materials and methods with regard to their effect upon the corrodibility of bright steel. The effect of cleaning upon the subsequent corrodibility of the steel was the primary consideration of the study. Cleaning methods, using either abrasives or alkaline compounds, or volatile or partially volatile solvents, and emulsified solvents were compared in their effects on bright steel and when exposed in the "acidic atmosphere cell." Emulsified solvent cleaning materials which leave a film of nonvolatile emulsifier render steel surfaces the least corrodible. Steel cleaned with such materials can usually be further processed by inspection, machining, bonderizing or painting without any additional cleaning step and may be held over for indefinite periods without corroding in an industrial atmosphere.

A new descaling process was said to eliminate most of the objectionable features of acid pickling. It is based on the use of a powerful reducing agent, sodium hydride dissolved in fused caustic, which reduces the metallic oxides in the scale. The reduced scale remains in loosely adherent form on the surface of the work. In operation, the scale is reduced by immersing the work in the fused bath. Upon quenching the work in water, the reduced material is blasted from the sur-

face by the generation of steam and it remains only to brighten the surface by a few seconds dip in acid.

Plating on Plastics

Plating on plastics has increased greatly in the post-war period. This unique combination of nonconductor and conductor has important possibilities in radio, television and electronics. The present uses of metallized plastics include screens against magnetic fields, high frequency currents or radium emanations in electrical and electronics engineering. The plated plastic remains nonconductive but the conductivity of the surface can be utilized. Commutation is improved by selective electroplating in depressed grooves; costly inserts and assembly operations are similarly eliminated in electric shielding of aircraft instruments and in radio shielding devices.

Interest in electropolishing is expanding rapidly and the process is on the way to an important place in metal finishing, stimulated by shortages in materials and lack of skilled polishers. Electropolishing, since it does not provide the cutting and burnishing action of wheels, does not give the equal in appearance of a mechanically polished, buffed and colored surface. There is no "electrolytic wheel finish." However, it does produce a new surface finish which is highly satisfactory in countless applications. The process is applied with practical advantage to wrought, cast, and electrodeposited metals, on stainless steels, low alloy and carbon steels, red brasses, aluminum and its alloys, copper, nickel, monel, nickel-silver, nickel-chromium alloys, silver, magnesium, and zinc. Commercial applications include costume jewelry, electric appliances, automotive and architectural trim, name plates, novelties, small tools, electronic parts, wire products, kitchenware, plumbing fixtures and watch parts.

Silver plating of aircraft engine bearings was discussed in detail by John S. Hart and C. E. Heussner. Both copper and nickel were tried as an intermediate layer between the silver deposit and the steel but the use of the copper was found to result in the formation of a brittle diffusion alloy of silver and copper. Most of the effort was put on the use of a nickel strike whereby perfect adhesion was obtained. The adhesion was stronger than the silver deposits both in the plated condition and after annealing at 950°F for 1 hr. At no time was poor adhesion noticed before the annealing operation. Tests showed the bond strength to be in excess of 50,000 psi before annealing. 35,000 afterwards. It was found that with good quality bright silver deposits, the tensile strength was about 48,000 psi.

F. C. Mesle also described exhaustively the silver plating of bearings, one of the many war projects of Oneida, Ltd. The average weight of silver plate on a bearing was about 10 oz. The full three-shift capacity for plating was 35,000 bearings weekly. When plating to capacity, over 12 tons of silver were deposited per week. The fact that Oneida was only one of a half dozen concerns producing silver plated bearings will give some idea of the demand for silver-lead-indium bearings during the war.

A bright silver plating process was the result of the accidental use of a silver plated wire in cleaning phosphor bronze electrolytically. Credit for developing the novel electroplating method was given to Dennis R. Turner, physicist in the electronics department of the research laboratories of the Westinghouse Electric Corp. With the new method, the silver-plated object is immersed in a silver cyanide solution as in the regular plating operation. However, instead of passing current continuously through the bath as in plating, current is applied in about four times the amperage used to plate the metal, but not continuously. The current is applied for a few seconds, discontinued, and then passed through the bath again. This intermittent action is repeated for several cycles. When the article has reached its peak of luster, it is removed from the bath, rinsed and dried. The entire operation is said to take little more than a minute.

Clifford Struyk described his experiences with true bronze (copper-tin alloy) plating for stopoff against nitriding, and suggested peace-time uses of electrodeposited bronze coatings for decorative purposes.

Deposition of nickel-cobalt alloys from chloride solutions was reported by C. B. F. Young and Clifford Struyk. Nickel-cobalt alloys were deposited from chloride solutions buffered with boric acid. Many deposits were bright or semi-bright. A satisfactory bath contained 110 g per liter nickel chloride, 5.5 g per liter cobalt chloride and 15 g per liter boric acid; at pH between 1.5 and 2 and room temperature, the bath gave satisfactory deposits at cathode current densities of 15 to 50 amp per sq ft.

E. E. Halls reported that an electroplated coating of indium has lubricative properties and helps considerably in the drawing of aluminum alloys.

The electrodeposition of speculum was reported by R. M. Angles, F. V. Jones, J. W. Price, and J. W. Cuthbertson. A rather complete investigation was

BUFFING small die castings in a large automobile parts plant.

DISCHARGING small metal parts after wet tumbling.

made on the electrodeposition of speculum (tin-rich white bronze) from solutions containing sodium cyanide, copper cyanide, caustic soda, sodium stannate and, in some cases, soda ash and Rochelle salt. Tin and copper anodes were controlled in separate circuits to maintain the optimum copper-tin ratio in the solution. The composition of the deposit was maintained within 2 pct, largely by control of the free cyanide and free caustic concentrations in the solution. Recommended deposit composition for plating was 45 pct tin—55 pct copper; recommended operating temperature 149°F.

Properties of electrodeposited copper-lead alloys were given by Franz Bollenrath, Berlin, Germany. Copper-lead alloys with about 18 to 25 pct lead used extensively for high performance friction bearings have, in the past, been prepared as cast bearings with steel supporting shells. The difficulties encountered in the preparation of some types of bearings led to attempts to deposit copper-lead alloys electrolytically on the steel liners. Test bearings with electrolytic lead bronze layers containing 8 to 12 pct lead showed a compressive strength comparable to that of cast lead bronze-lined bearings.

Lead-tin alloy plating was described by A. E. Carlson and J. M. Kane, presenting information on methods of plating lead-tin alloys containing any desired amount of tin from 5 to 60 pct. Details were given for the use of separate lead and tin anodes in the deposition of low tin-high lead alloys, and for the use of alloy anodes. Necessary modifications for the successful plating of bearings were discussed and some typical applications of lead-tin alloy coatings were listed.

The protective value of lead and lead-tin deposits on steel was the subject of an interesting study by A. H. Du Rose. It was shown that lead deposits give surprisingly good corrosion protection to steel and that the glue concentration is an important factor in the protection offered, particularly as shown by salt spray tests. A lead-tin alloy deposit containing 5 to 6 pct Sn exhibits corrosion protection superior to that of pure lead or to that of alloys of higher tin content.

Luther E. Vaaler and M. L. Holt described a new aqueous plating bath for the electrodeposition of tungsten-nickel alloys. The bath contained sodium tungstate, citric acid, nickel sulfate and ammonium hydroxide. The most satisfactory bath contained 20 g per liter $NiSO_4.6H_2O$; 50 g per liter $Na_2WO_4.2H_2O$; 66 g per liter citric acid; and NH_4OH to give a bath pH of about 8. When this bath was used at a temperature of 158°F and a current density of 7 to 15 amp per dm., the bright, shiny cathode deposit contained about 35 pct tungsten and the cathode current efficiency was 40 to 45 pct.

Miscellaneous Finishing Developments

An interesting innovation was a method of nickel plating on steel by chemical reduction developed by Brenner and Riddell of the National Bureau of Standards. An adherent, compact nickel coating can be deposited by immersion, on iron, nickel, gold, cobalt, palladium, and aluminum (not on platinum, copper, zinc or lead). No appreciable precipitation of nickel occurs throughout the bulk of the solution or on the walls of the glass vessel.

Clifford Struyk and A. E. Carlson presented the results of an extensive investigation of the copper fluoborate plating electrolyte and its operating characteristics. The data include preferred bath compositions, the effect of bath constituents and additions on limiting cathode current densities and resistivity at several temperatures, current efficiencies and anode performance, as well as hardness and tensile data on heavy copper deposits. The comparison of the fluoborate with the sulfate type of bath shows in a striking manner the high-speed plating characteristics of the fluoborate type, which offers great promise in applications requiring heavy copper deposits. Rapid plating of moderate thicknesses of copper as an undercoat for

nickel and chromium is also an attractive possibility.

The production of precision seamless tubing by electrodeposition was reported by J. Albin. Parts of identical dimensions with high interior surface finish in S-shapes, round or square tubes, tapers, rectangular or parabolic cross sections, were produced by electroforming with iron by the Ecco Process for venturis, nozzles, injection systems, radar horns and aircraft radio antennae. Finished parts may be combinations of nickel, copper or chromium together with iron, depending upon the requirements.

In the production of radar horns, a low-melting-point alloy was cast in a polished steel mold. After removal, the cast matrix was highly finished and an iron electroform was made. The matrix was melted away, leaving a shell of iron with the surface finish of the matrix. The process was utilized in salvaging worn and undersized parts, such as Navy diesel cylinder liners. In some cases a porous chromium deposit was used in addition to the iron for maximum wear resistance. The electrodeposited iron had a Brinell hardness of 225 but could be annealed to 140. Case hardening produced the characteristic pearlite structure of steel. Control of the special electrolyte makes possible continuous operation for as long as 4 or 5 yr without shutdown.

The inside of steel pipe can be electroplated with nickel or other metals by means of a process developed by the Bart Manufacturing Co., Inc., Belleville, N. J. The Bart process is said to develop a smooth, ductile, pore-free nickel deposit fully adherent to the base metal, applicable to pipe or tubing up to 18 in. overall diam, in random lengths of approximately 20 ft at relatively low cost. The internally plated pipe can be welded, reduced and bent hot or cold without destroying any portion of the internal lining. It is expected to find applications in the production or handling of petroleum, chemicals, foods, textiles, plastics, coke and gas, glue, gelatin, paints, varnishes, sugar, paper, dyes, glass, and ceramics.

A new modified chromic acid anodizing process for aluminum was reported by C. J. Slunder and H. A. Pray. A wartime shortage of chromic acid made necessary a study of chromic acid anodizing by a process in which bath maintenance is achieved by sulfuric acid additions. The sulfate content of such baths introduces corrosion difficulties when steel tanks are used. However, with protected tanks and carbon cathodes and by controlling the operation on the basis of anode current density, the process appears from the laboratory tests to offer promise of a considerable saving in chromic acid consumption.

Krome-Alume, Inc., Lockport, N. Y., original licensors of the Travers process for plating aluminum and its alloys announced that they were no longer interested in this plating procedure and had completely abandoned it in favor of a new process which was felt to be an improvement over the old procedure. The old method required from 12 to 18 min of preplating treatment; the new, only 2 min. Immersion in any plating bath regardless of its composition, acid or alkaline may be practiced. In the case of nickel, a direct deposit is applied, a flash of copper being unnecessary. Aside from the cleaning cycle which follows along normal lines, only one chemical solution is used in making the aluminum article available for plating.

The new procedure consists of anodizing with 6 v dc in a special solution, for 1½ to 2 min, followed by rinsing and immediate plating, no modification of the anodic film, as in the case of the old procedure, being necessary.

Cutter described a new process for protecting magnesium from the attack of corrosive agents by preventing the formation of an electrolytic couple when in contact with a dissimilar metal. It also produces a good paint base by means of a slightly acidic nonmetallic surface.

R. B. Mason described a protective finish for magnesium alloys. After thorough cleaning of the part, it was anodized in a 5 pct sodium hydroxide solution at 150°F and 12-18 amp per sq ft for 30 min to obtain a thickness of approximately 0.0005 in. Following the electrolytic treatment, the part was thoroughly rinsed, then sealed in a sodium chromate solution at 170 to 180°F for 30 min. Dichromates are unsuitable since anodic coatings are stripped in acid solutions.

Exposure results for variously treated AMC 265, AMC 52-S, and AMC-573 were shown. In every case, the above treatment afforded adequate protection. The coating also provided resistance to abrasion.

Reducing embrittlement in electroplating was the title of an interesting article by C. T. Eakin and H. W. Lownie, Jr. The embrittlement of steel springs by hydrogen released from the electrolyte during plating is a phenomenon that causes failure at far below service stresses. The authors outlined procedures, substantiated by several years production experience, whereby such embrittlement can be minimized during the plating operation and removed by heat treatment following plating. A nonacid method for deplating was also presented.

Organic Finishes

Almost all of the material used in organic finishes is now free from government restrictions and controls. Actually, however, severe shortages exist, due to dislocations of sources of supply, greatly increased exports and the unprecedented demand.

New finishes include those which bake quickly at high temperatures, up to 700°F, and as quickly as in a few seconds. They are supplied either clear or pigmented in many colors. The base is a thermosetting resin with high chemical resistance.

Another new finish has a decorative, hammered-like appearance. One coat may be sufficient, using ordinary spray equipment. It hides weld marks, scratches and other defects in the base metal.

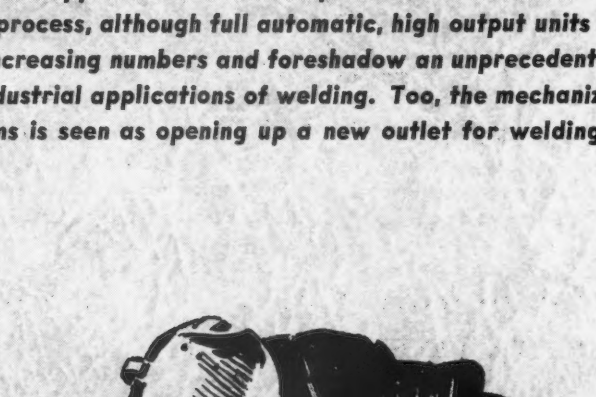
High-grade, abrasion-resistant, decorative coating materials for plastics may be applied over a low-priced, dark-colored base. These coats may be air dried or baked, giving high appearance, resistance to wear and corrosion; at the same time much lower in cost than a product made of solid colored plastic.

Still another new material is the 100 pct solid resin-impregnating compound newly developed for electrical insulation, which bakes to a very hard coating with high dielectrical qualities and moisture resistance.

Acording to Arthur P. Schulze, the processes of "detearing" and spraying paint electrostatically rank near the top of finishing developments. They have produced more uniform finishes with substantial savings in coating material, on bazooka barrels, powder containers, steel cartridge cases and a great many other war weapons, and they promise similar improvements in civilian products.

WELDING

The year 1946, welding's first full year of peace, was an eventful one, with many substantial advances being recorded in widening and consolidating the scope of its application. Manual operation continued to be the most widely used process, although full automatic, high output units are appearing in ever increasing numbers and foreshadow an unprecedented broadening of the industrial applications of welding. Too, the mechanization of the nation's farms is seen as opening up a new outlet for welding equipment.



By H. E. LINSLEY
Machine Tool Editor
THE IRON AGE

UNLESS, or until controlled atomic energy comes to be applied to the science of joining metals, there would seem to be but little possibility of any radically new developments taking place in the field of welding in the immediate future. Virtually every known source of heat and energy, gases of various kinds, high and low frequency electricity, the ac and the dc arc, chemical reaction, pressure, impact and numerous combinations of these have been applied to bring about the permanent attachment of one piece of metal to another. Nevertheless, so widespread is the interest in welding, and so important is the place it now occupies in the industrial scene, that research staffs all the world over are constantly seeking still newer and better methods of utilizing welding techniques.

As with all research, the task is likely to be long and slow, and unless some fortuitous discovery should take place, most advances will probably consist of step by step improvement of existing methods and equipment whereby the present known processes can be performed more easily and rapidly and with still greater freedom from defects. There are still many avenues to be explored in this latter regard, particularly in the avoidance of porosity and slag inclusion. But this does not mean that, when performed by a capable and conscientious worker, welding is not as nearly a 100 pct reliable method of joining as any other commercial joining process.

Restricted By Codes

Until the time that science can bring about the automatic elimination of all sources of error, including the human error, it will always be possible to make a bad weld, just as it is always possible to make a bad joint by any other method. But that scarcely seems a justification for hedging the welding process around with a maze of regulations and restrictions to the extent that normal development is hampered. The economic advantages of welding are frequently offset by the expense of performing the elaborate, and often unnecessary, rituals of inspection demanded by present codes.

Codes, however, are in the process of revision at the present time on a national scale. Meanwhile, following the extremely wide use of flame cutting and arcwelding in the production of all types of ships, welded fabrication is coming into practice on a large scale in the structural industry. When codes are revised, and when steel producers manufacture steels designed expressly for structural welding, the familiar sound of the rivet gun may be replaced by the hiss of the welding arc and structural design will be made a great deal more flexible.

Welding is, after all, no new process. In its basic form it is probably as old, if not older, than riveting or any other method of metal joining. Yet, apparently only because of the continued development of infinitely better methods of performing it, it is prone to be regarded as an upstart that must be kept strictly in its place. When, a relatively few years ago, it first developed into a production manufacturing process, the application of close control and rigorous inspection was perhaps not unnatural, particularly among those to whom the process was unfamiliar. But the extent to which it has been used during the late war should, by this time, have accorded it at least the same recognition as is accorded to riveting, bolting, or any other joining method.

The answer may, perhaps, lie in the nation's schools. If the curricula included more instruction in the fundamental theory of welding, there would, in a few years' time, exist within the engineering profession a healthy group of young engineers to whom welding would appear as a normal production procedure.

Gas Welding Developments

Developments in the gas welding field have tended to be somewhat obscured by the more spectacular advances in electric welding. But there are, nevertheless, many applications for which gas furnishes the best or only practical method. Gas cutting is perhaps outstanding in this regard, particularly for heavy, continuous and automatic work on low alloy steels. Steel mills, in particular, have been paying greater attention to flame cutting to replace costly shears and saws, and billets up to 50 in. are now being cut regularly at but a fraction of the cost in time and energy that would be required for sawing.

It is in production work, however, that flame cutting has made the greatest advances, and fully automatic equipment for this purpose is now accepted as commonplace. The various types of pantograph machines are already well known, but a recently developed[1] electric eye unit (fig. 1), is worthy of particular attention. With this equipment the customary templates are discarded and tracing is effected by a tiny light beam following a profile laid out in black against a white background.

The cutting of stainless and high alloy steels has reached a high state of development[2], due, in particular, to the technique of applying a stream of fluxing material directly into the flame through the center of the torch orifice. Not only is this faster than machining to shape, but there is a substantial saving in scrap which may be in pieces large enough for fabricating other small parts.

A completely new process[3] has also recently invaded the cutting field and may be considered as one of the outstanding developments of the year. Briefly, it is a combination of gas and arcwelding involving the use of a tubular, mild steel, coated rod from which the arc is struck. A stream of oxygen passes through the center of the rod and impinges on the arc. Temperatures created by this arrangement are said to be more than 3000°F higher than can be reached with an oxy-

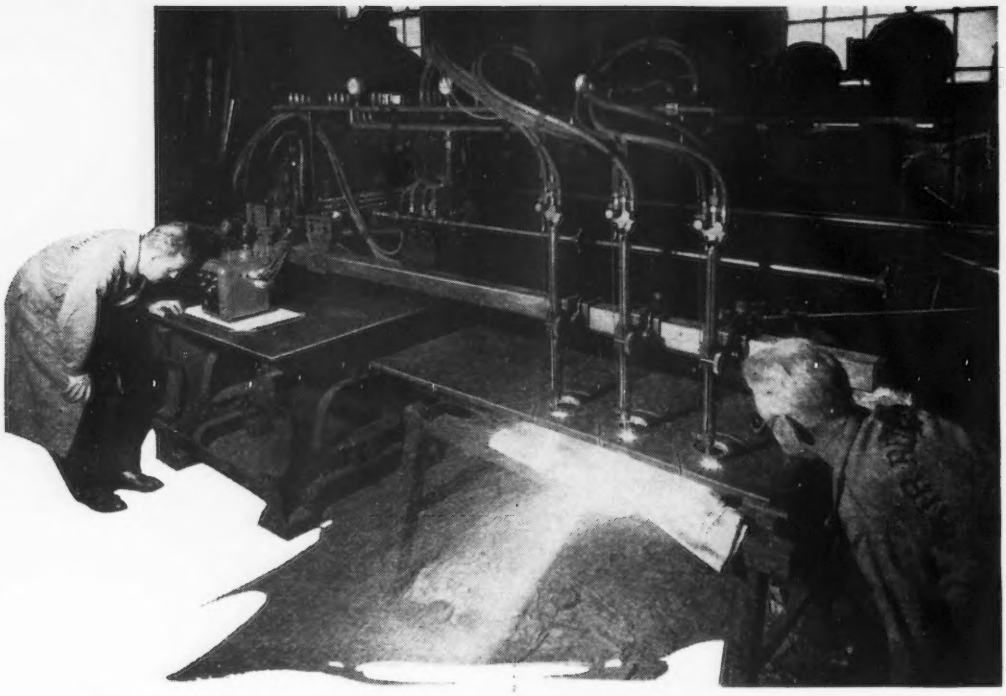


FIG. 1—Attached to a standard flame cutting machine, an electronic tracer (left) makes possible the cutting of intricate profiles from simple drawings, without the use of conventional metal templates.

acetylene flame, and some extraordinary results have been achieved. The rod is consumed in the cutting or piercing operation, but the intense heat and the liberal supply of oxygen cause complete oxidation of both rod and coating, and there is said to be no contamination of the parent metal. The heat, moreover, is so highly localized that the heat affected zone is held to an absolute minimum, and there is no carbide precipitation to reduce the corrosion resistant properties of stainless steels.

In addition to its use on stainless, the process is being applied to the cutting of almost every industrially used metal, including such hard-to-cut materials as Hastelloy, Monel, copper alloys, Everdur, bronze, aluminum alloys, nickel and chrome nickel alloys, as well as all types and grades of steel. The same rod is used for all materials and no special skill is required. Similar in this respect to contact arc-welding, the rod is merely drawn across the surface for cutting, or literally pushed through the work for piercing.

Another new process that has aroused considerable interest is welding by means of powdered metals[4]. Oxygen and fuel gas are used as in conventional gas welding, but in place of a welding rod a stream of powdered metal is injected into the flame of a specially designed welding torch. The powdered metal is mixed with a predetermined amount of suitable flux and is fed to the torch tip by gas pressure. Since all the material is used dry there is no danger of producing oxidation as is the case when liquid fluxes are used. A processing gas surrounds the flame cone to form a controlled atmosphere, and any desired temperature of flame, powdered material, or workpiece may be obtained.

FIG. 2—Unique in every respect, this giant LeTourneau machine for making concrete houses is typical of modern utilization of welding technique in the construction of massive, hard working equipment.

Welding Application

The castings shortage has become chronic during the past year, and there seems little likelihood that conditions in the foundry industry will improve for quite some time to come. As shown in fig. 2, many builders of heavy equipment, machine tools, presses, road equipment, earth moving machines and similar items have been forced to turn to welded construction in order to stay in business, and almost without exception have found, often to their great surprise, that the new method

eliminates a great deal of dead weight, simplifies construction, lowers costs and results in a better, stronger product that may be modified to suit changing conditions or customer preference at costs usually lower than would be encountered with other types of construction.

There has been a considerable renewal of interest in the manufacture of tubing by gas welding and the development of a new continuous tube welding machine has made it possible to produce a high quality product at a rapid rate and at reasonable cost. An interesting new field has recently been opened up in the gas pressure welding of alloy steel tubing[5]. The ends of the tubing are butted together and heated by a gas flame to a plastic, but not molten state. Pressure is then applied to force the heated ends together and produce the weld, as shown in fig. 3. Joints made in this manner have been found to be equivalent in strength to the parent metal, even when heat treated to high tensile strengths, although this cannot be consistently maintained. An average strength of about 150,000 psi may, however, be generally counted upon. The chief obstacle to 100 pct joint efficiency appears to be the presence of oxides dissolved into the adjacent metal. It seems doubtful whether these can be eliminated entirely, although research is continuing. The process, however, marks a distinct forward step in welding techniques and should find many important industrial applications.

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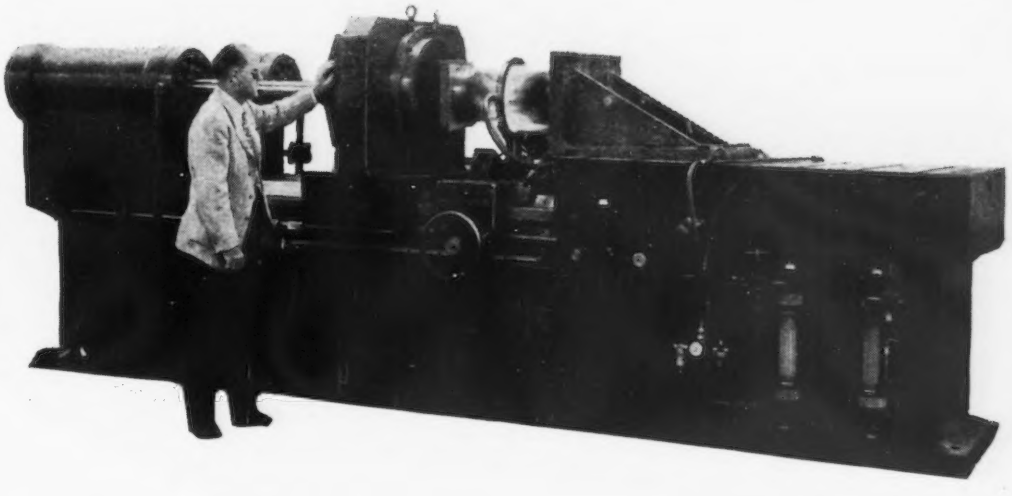

FIG. 3 — Capable of welding sections of alloy steel tubing up to 20-in. diam, this machine heats the ends of the stock in a gas flame, and then forces the ends together under high pressure to produce welds of almost 100 pct efficiency.

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Uses of gases in conjunction with the electric arc, as in atomic hydrogen welding, is sufficiently well known to need no further comment. Helium shielded arcs also have been used for some time in the welding of magnesium, but use of this method on stainless steels is a recent development[6] offering considerable improvement over other methods. One of the latest techniques, involving the use of a tungsten electrode and an argon or helium shielding atmosphere, and without flux, is reported to have given exceptionally fine welds on aluminum with complete freedom from inclusions or porosity. Excellent results have also been obtained on magnesium and various ferrous and nonferrous metals, particularly in light sheet form.

Immediately following VE-Day, U. S. industrial intelligence teams swarmed into Germany in an effort to ferret out the much touted secrets of German war production. For some reason, known only in Washington, virtually all of the reports from these teams have been imprinted with the "Restricted" stamp, and have been released only in a very thin trickle. Nevertheless, it has become increasingly apparent that the vaunted technological superiority of German engineers is as much a myth as the Nazi theory of the Master Race.

No evidence has appeared thus far, and it is doubtful whether any will ever appear, that German welding operations even approached the efficiency or degree of application achieved in this country. Continuous, automatic welding does not appear to have been used at all and although some equipment, similar to American models, was found to be under construction, none of it had reached the stage of practical use.

From Holland, on the other hand, word is received of an interesting new technique known as contact arc-welding[7]. Whether this is a postwar development, or whether it was produced before the invasion and quietly slipped underground until the Germans had been disposed of, is not yet clear, but if and when it is adopted by American industry, it should advance the application of welding to a considerable degree. Briefly, it consists of employing a special electrode with an extremely thick coating which contains 50 pct or more of the metal usually existing in the rod. The end of the electrode is merely brought into contact with the surface of the work, and the arc ignites automatically. The deep cup resulting from the heavy coating prevents the end of the rod from touching and freezing to the work, and the welding operation is reported to be as simple as drawing a candle across a hot plate.

Automatic Equipment

American fabricating industries, forced by rapidly rising wage scales and the general decline in worker output to seek new methods of increasing productivity, are turning more than ever to fully mechanized spot-welding[8], and some remarkable machines have been produced during the past months. One of the largest of these is shown in fig. 4 and is capable of handling the whole side of a Pullman car. Using photoelectric cells for control, the machine is used for welding the vertical stiffeners to the side plates and is capable of making 48 spots at a stroke. Others, less spectacular perhaps, but equally efficient, are appearing in both

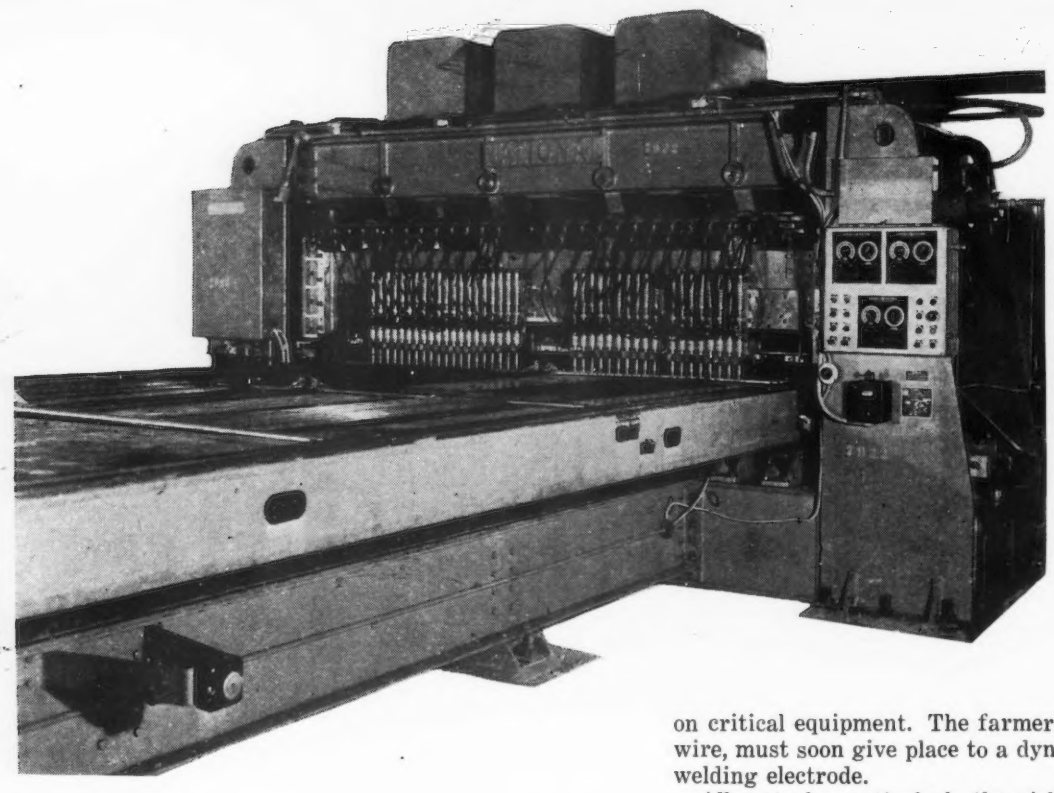

FIG. 4—Capable of performing as many as 48 welds at a time, this giant automatic spotwelder, employed for attaching stiffeners to Pullman car side sections, is typical of the trend toward electronically controlled, fully automatic machines.

light and heavy industries, and it seems safe to assume that the next few years will find a complete acceptance of fully automatic spotwelding as the fastest and most economical method for the joining of metals, particularly on a large scale.

The automobile body industry is an outstanding example of this trend, and there is little doubt that in the very near future welding operations on auto bodies and other sheet metal products will be performed on a constant flow line, using moving fixtures and automatic welders. The machines themselves are already available, and it should not be too difficult a task to link them into a production line in such a way as to assure continuous operation, eliminating the handling, stacking and storage of parts and subassemblies between operations.

Conventional arcwelding has more than held its own during the past year and has been steadily reaching out into new fields. One of the most promising of these from the point of view of potential sales, is the farm market. Rural electrification is spreading very rapidly and the next few years should see a substantial part of all farm properties supplied with adequate power. This factor, coupled with a notable increase in national farm income, should create a steady market for a low priced, reliable, easy to use welding outfit, and most of manufacturers already have or shortly will have suitable outfits ready for quick delivery. Even in areas which the power lines have not yet reached, small, economical, portable welding outfits are available in a wide range of sizes with engine-driven generators. A typical example of the farm welder is shown in fig. 5. Rugged construction, complete weatherproofing simplicity and flexibility of operation and low operating cost are outstanding features of these new machines.

With farming becoming steadily more mechanized, a welding outfit should pay for itself within a very short time by preventing costly down time for repairs on critical equipment. The farmer's old friend, baling wire, must soon give place to a dynamic newcomer, the welding electrode.

Alloy steels, particularly the nickel alloys, are rapidly increasing in popularity and considerable research has been applied to the technique of welding them[9]. Some of these, most widely used for heat-treated machine parts, display a tendency to develop hard brittle areas adjacent to the weld deposits, reducing the toughness of the joint and frequently cracking during or after cooling. Investigations indicate that susceptibility of the base metal to weld cracking may be due to a combination of high hydrogen content in the steel and high hardness resulting from rapid cooling. Electrode coatings containing considerable combined water and organic matter may be a source of hydrogen in the weld metal, and cracking tendencies may be lowered in some highly hardenable alloy steels by welding with a lime or other inert type of coating. Electrode manufacturers have been alert to this problem, and several commercial grades of electrodes have been produced which permit welding of some hardenable grades of low alloy steel without the necessity of preheating. The frequency of underbead cracking is quite low with these electrodes.

The manufacturers of electrodes have contributed greatly to the art of welding and industry is indebted to this group for the high quality electrodes commercially available today. They are responsible not only for developing a high-grade product, but have also in many instances been responsible for working out practices for applying it.

Some noteworthy advances have also been made in the application of flash welding. Already well established as a production process on low carbon steels, it is now being applied very successfully to alloy and high carbon steels for the production of strong, efficient joints at high speed and low cost. Conventional equipment and methods, however, have been found to be unsatisfactory since the joints tend to be hard and brittle as a result of the rapid cooling of the material. Post-weld heat treatment, of course, would overcome this, but the usual methods are not well adapted to high

carbon steel welded assemblies. Both flame and resistance tempering of the welds can be accomplished, but the strength of the joints is lowered considerably because of inadequate control over the drawing temperatures and the increases in the width of the heat-affected zone. Removal of the work from the dies for individual treatment of each joint destroys the time saving element of the process. Overall heat treatment of the entire assembly may have not only a detrimental effect on the base material but many of the extremely brittle joints may fail before the work can be transferred to the furnace.

Special equipment has now been evolved whereby an automatic heat treatment of the joint is achieved in the welding dies immediately after upsetting. The temperature is arrested at about 1000°F during cooling and held at that temperature until the desired structural transformation has been completed. Welds made in this way have been found to have about 90 pct of the strength of the parent material and to show good ductility.

The application of flash-welding techniques to the fabrication of aluminum and aluminum alloys, recently rendered practicable by the development of new equipment[10], should do much towards extending the use of extruded shapes for a wide variety of purposes. The high conductivity of the material necessitates extremely high welding currents, with the result that the power factor penalties are so great, even in metropolitan areas, as to make the process generally unprofitable when standard ac machines are used. Battery powered machines, however, are now available and are proving to be highly efficient. Tremendously high discharges are obtainable from the power-pack unit for the brief time needed to make the weld, while the batteries are kept up by a continuous charger unit which places no greater load on the lines than that occasioned by a standard 10 or 15 hp motor.

The past year has shown very clear evidence of the extent to which welding is now being accepted as a standard method of fabrication. This is particularly apparent in the fabrication of the heavier durable goods such as presses, press brakes, shears, machine tool beds, and that type of equipment commonly subjected to excessive abuse, such as earth moving equipment, bulldozers, graders and similar machinery. This does not mean, however, that the lighter items have been neglected. On the contrary, more and more manufacturers are looking to welding as a means of solving fabrication and assembly problems.

Builders of welding equipment, alert to this growing interest, are no longer satisfied with a single line of standard machines, but are turning their attention to engineering special types of machines for specific jobs. Where high production and economy of operation is concerned, the practice of tailoring the job to suit existing equipment is now giving place to designing the equipment to suit the job. These special machines, designed for every kind of product, from automobiles to bathtubs, give evidence of engineering ability of the highest order. Completely automatic, virtually foolproof and capable of turning out vast quantities of work to the highest standards of quality, these units are the logical complement to the high production machine tool. Almost daily some new use is being found for welding. Its speed, simplicity and safety make it the ideal fabrication tool, and the clean, smooth appearance of the welded joint adds immeasurably to the sales appeal, whether it be a locomotive or a coffee pot.

REFERENCES

[1] "Electric-Eye Flame Cutter," THE IRON AGE, Jan. 24, 1946.
[2] "Flame Cutting Stainless Steel," THE IRON AGE, July 11, 1946.
[3] "Cutting Stainless Steel With the Electric Arc," THE IRON AGE, Nov. 14, 1946.
[4] "Welding With Powdered Metal," THE IRON AGE, June 20, 1946.
[5] "Uniwelding Produces High Joint Efficiency," THE IRON AGE, Mar. 7, 1946.
[6] "Inert-Arc Welding," THE IRON AGE, Oct. 31, 1946.
[7] "Contact Arcwelding," THE IRON AGE, Dec. 12, 1946.
[8] "Automatic Welder Embodies New Principle," THE IRON AGE, Nov. 28, 1946; also "Multiple Spot Welder for Railroad Cars," THE IRON AGE, Sept. 5, 1946.
[9] "Welding of Nickel-Alloy Steels," THE IRON AGE, Jan. 24, Jan. 31, Feb. 7, and Feb. 14, 1946.
[10] "How to Weld Aluminum," THE IRON AGE, July 11, 1946.

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FIG. 5—Typical example of the type of welder now coming into increased popularity for farm use. Simple and economical to operate, it is built to withstand rough handling and exposure to weather.

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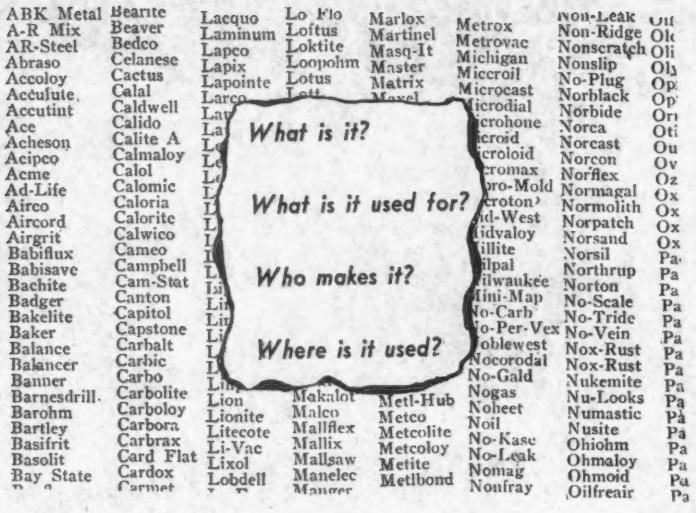
10,000
TRADE NAMES



Some 10,000 trade names covering a wide range of materials used in the metals and metalworking industries, listed in easy-to-read, alphabetical form, are presented herewith. Developed to provide engineers and other business executives with a ready source of accurate information, this directory tells what the trade name covers, its composition if it is a material, how or where it is used and full address of the manufacturer or supplier.

By T. W. LIPPERT
Editorial Director
THE IRON AGE

THIS trade name directory was started in 1940, then abandoned during the war through lack of manpower required for its preparation. However, during the past year, all companies in the metals, materials, equipment and process industries have again been contacted by letter for the collection of all new data on their trade names and also for the check on proper addresses.

Back in 1940 this directory was compiled primarily for use of the editors of THE IRON AGE, to ease their task of supplying information and satisfying the many requests for information that constantly arrive by mail and telephone. But the very urgency of the requests and the demands on the part of readers have indicated that all the purchasing agents, the metallurgists and technicians, and all the administrative personnel of industry are looking for and have need of a complete directory of this type, arranged in ready reference form, with pertinent data on composition and type of material, process or equipment, along with typical uses and full and correct name and address of the supplier.

It is believed that this directory, presented herewith, completely covers the following:

(1) All ferrous and nonferrous metals and alloys, both foreign and domestic, with the exception of tool steels. (Tool steels are fully covered in a separate IRON AGE DIRECTORY OF TOOL STEELS). Also listed are typical analyses and uses.

(2) All materials of interest to industry, such as plastics, glass, ceramics, chemicals, refractories, cements, lubricants, plywoods, etc.

(3) All processes of interest to industry, such as proprietary electroplating, finishing, welding, cutting, joining, testing and inspection processes, heat treating, surface conditioning procedures and methods, etc.

(4) All equipment and products produced by the metals industry, such as machine tools, small tools, rolling mills, cranes, bearings, joining devices, fabricating machines, and all the multitude of varied pieces of equipment made by those companies served by THE IRON AGE.

(5) All equipment and tools used in the industry. In this category it is very easy to slide into hardware items, and sometimes there is a very ragged dividing line between items listed in the directory and those which are not. Frequently the deciding factor on items of almost a hardware character (wrenches, special screwdrivers, and such) was that they happened to appear on lists along with more pertinent items.

In a directory of this size and diversity, there is considerable likelihood of omission of certain items that should be included, despite many checks and rechecks. In the search for unusual or little known items or processes, it is always embarrassing to discover that a very obvious name has been omitted. But, as this directory is printed in this and following issues of THE IRON AGE, those companies in the metals and metalworking field can check the trade names and send in any that do not appear. These will be incorporated in the first reprint made for general distribution.

THE IRON AGE Directory of Trade Names

A+1: Metal polishing and cleaning compound. J. L. Prescott Co., Passaic, N. J.

A+1: Polishing compounds. McAleer Mfg. Co., Rochester, Mich.

AA Nickel Anodes: Cast nickel, carbon containing anode, containing 18 pct cobalt. Hanson-Van Winkle-Munning Co., Matawan, N. J.

AAA: Tungsten hacksaw blades. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis 9.

AAAA: Genuine babbitt and anti-friction bearing metal. Thos. F. Seitzingers Sons, 900 Ashby Thomas St., N. W., Atlanta, Ga.

Abalyn: Gloss-producing liquid resin for lacquers, transparentizing agent for tracing papers, etc. Hercules Powder Co., Wilmington, Del.

Abbe: Ball, pebble, paint and tube mills, laboratory mills, jar mills, grinding, pulverizing mills, disintegrators, sifters, mixers, rotary cutters, etc. Abbe Engineering Co., 54 Church St., New York.

Abbott: Pipe fittings. Columbus Brass Mfg. Co., Columbus, Ohio.

Abbott: Tumbling barrels. Abbott Ball Co., 1944 New Britain Ave., Hartford.

A.B.C. Emery: For grinding, polishing, tumbling, sandblasting and for wear-resisting floors. Keystone Emery Mills, 4329 Paul St., Philadelphia 24.

A-B-K: Non-metallic bearings. Brake Shoe & Castings Div. of American Brake Shoe Co., 230 Park Ave., New York 17.

ABK Metal: Ni-hard alloy, extremely resistant to abrasion. American Brake Shoe Co., 230 Park Ave., New York 17.

ABK: Resinoid wheels. Rapids Standard Co., 7535 Bond Ave., N. W. Grand Rapids.

A.C.B.: Priming and finishing coating for metals. Tropical Paint & Oil Co., 1210 W. 70th St., Cleveland.

A.C.P.: Alkaline cleaner oil and grease remover. American Chemical Paint Co., Ambler, Pa.

AD: Speed reducers and gears. Abart Gear & Machine Co., 4835 W. 16th St., Chicago.

A-E Lo-Hed: Hoists. American Engineering Co., 2490 Aramingo Ave., Philadelphia 25.

AEF: Electric welders. American Electric Fusion Corp., 2606 Diversey St., N. Bergen, N. J.

AF: Conveying machinery and industrial washing machines. Alvey-Ferguson Co., North & Disney Sts., Cincinnati.

A.G.D.: Snap gages. Pratt & Whitney Div. of Niles-Bement-Pond Co., Charter Oak Pk., West Hartford, Conn.

A-I-W: Hard facing electrodes. Universal Power Corp., 4919 Euclid Ave., Cleveland.

A.M.C.: Demagnetizers. Alofs Mfg. Co., Eugene & Madison Aves., Grand Rapids.

AMC Treatment: Anodix oxidation of magnesium-alloy parts in sodium hydroxide electrolyte to form protective finish and base for paint. American Magnesium Corp., 2210 Harvard St., Cleveland.

A.P.I.: Gages. Pratt & Whitney Div. of Niles-Bement-Pond Co., Charter Oak Park, West Hartford, Conn.

A.W.: Steel sheets, steel, plates, floor plates, etc. Alan Wood Steel Co., Ivy Rock Rd., Conshohocken, Pa.

A.W.H.: Valve oils, slushing compounds. A. W. Harris Oil Co., Providence.

A-Y-A: Centrifugal pumps. Adkins, Young & Allen Co., 32 S. Jefferson St., Chicago.

Abbott: Profilometers. Physicists Research Co., Ann Arbor, Mich.

Abco: Burnishing balls. Abbott Ball Co., 1044 New Britain Ave., Hartford, Conn.

Abernathy: Vises. Abernathy Vise & Tool Co., Chicago, Ill.

Abrasaw: Cut-off machine. Bridgeport Safety Emery Wheel Co., Inc., 1295 W. Broad St., Bridgeport, Conn.

Abrasist: Abrasion-resisting castings. Thomas Foundries, Inc., 38th at 10th Ave., N., Birmingham.

Abrasite: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Abrasive: Grinders. Abrasive Machine Tool Co., 10 Duncllen Rd., East Providence.

Abraso: Artificial abrasives. Allied Industrial Products, 620 N. Michigan Ave., Chicago.

Abraso: Sizing screen made from specially heat treated carbon steel wire for maximum abrasion and fatigue resistance. John A. Roebling's Sons Co., Trenton 2, N. J.

Abrasohard: Abrasion-resisting welding rods. Universal Power Corp., 4919 Euclid Ave., Cleveland.

Abrasoweld: Self-hardening cast hard-facing rods for wear and abrasion resistance. Lincoln Electric Co., 12818 Coit Rd., Cleveland.

Abrasoweld: Abrasion-resisting welding electrodes. Lincoln Electric Co., 12818 Coit Rd., Cleveland.

Abrazaflex: Abrasion-resistant coating. Flexrock Co., 2367 Manning St., Philadelphia.

Absco-Meehanite: Castings of high strength wear and corrosion resistance, tough, etc. American Brake Shoe & Castings Div., 230 Park Ave., New York 17.

Absorb-Oyl: Mineral floor compound that will pick up spilled mineral oils around the base of machinery. W. H. Barber Co., Chicago 32.

Acaset: All purpose air-setting cement. Armstrong Cork Co., Lancaster, Pa.

Acco: Sash chains, coil chains, steel loading chain vises. American Chain Div. of American Chain & Cable Co., Inc., York, Pa.

Accoloy: Heat resistant and stainless steel castings. Alloy Casting Co., Champaign, Ill.

Accolloy: 3.5-Ni alloy steel for chains. American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn.

Accrus: Cutting lubricant, wire drawing soap, etc. International Refining & Mfg. Co., Evanston, Ill.

Acculute: Standard volumetric solutions and standard solutions for quantitative analysis in concentrated equivalents, packed in sealed glass or paraffin ampoules depending upon the chemical nature of the solution. Anachemia Ltd., 70 E. 45th St., New York 17.

Accurate: Screw machine products. Lincoln Mfg. Co., 2621 Fletcher St., Chicago.

Accurate: Bushings. Accurate Bushing Co., 439 North Ave., Garwood, N. J.

Accutint: Chemical test paper, sensitized with various chemical indicators so that the required pH standard may be obtained; simple to use as litmus paper and are packed in glass vials which bear the color standards and pH values covered by the range of the papers in the vials. Anachemia Ltd., 70 E. 45th St., New York 7.

Ace: Electric, resistance (spot) welding machines and electric, weld-timing control equipment. Pier Equipment Mfg. Co., 2402-48 Milton St., Benton Harbor, Mich.

Ace: Fasteners. Ace Fastener Corp., 3415 N. Ashland Ave., Chicago.

Ace: Firebrick, etc. John J. Moroney & Co., 2825 W. Harrison St., Chicago.

Ace: Tool handles. Burroughs-Ross-Colville Co., Whitson Bldg., McMinnville, Tenn.

Ace: Gear lubricants. Midwest Oil Co., 2500 Minnahaha Ave., Minneapolis.

Ace: Taps and dies. Henry L. Hanson, Worcester.

Acerold: Alloy castings. Central Foundry Co., Joplin, Mo.

Acheson: Carbon and graphite for furnace electrodes. National Carbon Co., Inc., 30 E. 42nd St., New York 17.

Acheson: Graphite powders, electrodes and anodes. Acheson Graphite Corp., 30 E. 42nd St., New York.

Acidon: Acid-proof paint. Heil Engineering Co., 12900 Elmwood Ave., Cleveland.

Acidseal: Tank linings, acid-proof paint. B. F. Goodrich Co., 450 S. Main St., Akron, Ohio.

Acidur: Corrosion resisting iron alloy with 16 Si; for chemical apparatus. Maschinenbau, A.G. Golzern-Grimma, Germany.

Acimet: Series of copper alloys with Al, Sn-Pb-Zn or Al-Sn-Zn-Fe-Mn for acetic acid equipment, breweries, alcohol plants. Cleveland Brass Manufacturing Co., 4606 Hamilton, Cleveland.

Acma: Packaging, wrapping, weighing and dosing machines, mixers, dry and powdered materials. Aurelio Tanzi Engineering Co., Wyckoff Ave. & Jefferson St., Brooklyn.

Acipco: Cast-iron pipe and columns. American Cast Iron Pipe Co., Birmingham.

Acitrol: Pickling inhibitor. E. F. Houghton & Co., 301 W. Lehigh Ave., Philadelphia.

Acme: Automatic screw machine. National Acme Co., E. 131st & Chapin Sts., Cleveland.

Acme: Blowers and gas pumps. Roots-Connersville Blower Corp., Connersville, Ind.

Acme: Chain. Portland Chain Mfg. Co., Portland, Ore.

Acme: Claybrick. General Refractories Co., 111 S. Broad St., Philadelphia.

Acme: Core Ovens. Monarch Engineering & Mfg. Co., Curtis Bay, Baltimore.

Acme: Cutting oil and gear coating, roof coating, belt dressing, oil soap, etc. Acme Refining Co., 3591 W. 56th St., Cleveland.

Acme: Dark-colored sulfurized mineral cutting oils of the high-active-sulphur type. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80.

Acme: Drill jig bushings, dowel pins, leader pins, leader pin bushings, etc. Acme Industrial Co., 203 N. Laflin, Chicago.

Acme: Electric spot welding machinery. Acme Elec. Welder Co., 2620 Fruitland Rd., Los Angeles.

Acme: Everlast firebrick. Acme Brick Co., Ft. Worth, Tex.

Acme: Everset high temperature mortar. Acme Brick Co., Ft. Worth, Tex.

Acme: Forging, threading and tapping machinery. Acme Machinery Div. of Hill Acme Co., St. Clair & Bruch Aves., Cleveland.

Acme: Hi-Tensiloy iron, Acme Foundry Co., 2500 22nd St., Detroit.

Acme: Hoists. Union Mfg. Co., 297 Church St., New Britain, Conn.

Acme: Pumps. W. & B. Douglas Pump Co., State Rd. & Levene St., Philadelphia.

Acme: See Superstrip, Steelstrap, Unit-Load, Silverstitchers. Acme Steel Co., 2840 Archer Ave., Chicago 8.

Acme: Spring Wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Acme: Strip steel, lacquered steel and steel strapping. Acme Steel Co., 2836 Archer Ave., Chicago.

Acme: Transformers. Acme Electric & Mfg. Co., 40 Water St., Cuba, N. Y.

Acme: Various composition products. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Acme Base: Highly sulfurized, fatty oil base, in two grades, for blending with paraffine oils. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80.

Acme-Gridley: Multiple and single-spindle automatic bar and chucking machines. National Acme Co., 170 E. 131st St., Cleveland 8.

Acmeite: High test die blocks. Madison Foundry Co., Cleveland.

Acmelene: Pipe threading and cutting oil. Acme Refining Co., Cleveland.

Acmeloy: High-strength corrosion, heat and wear-resistant Si-Mn cast iron for special castings. Acme Foundry & Machine Co., Blackwell, Okla.

Acmesol: Soluble cutting oil. Acme Refining Co., Cleveland.

Acme XL: Threading machines, single or double spindle, eight-speed all-geared headstock and powerfeed carriage; 1 to 2½ in. Hill Acme Co., 6400 Breakwater Ave., Cleveland 2.

Acme XN: Forging machines (upsetter) with fully suspended slides, eccentric main shaft and air operated ventilated friction clutch: 1 to 5 in. Hill Acme Co., 6400 Breakwater Ave., Cleveland 2.

Acme XT: Tapping machines, semiautomatic, six or eight spindles, 1 in. and 2 in. for nut tapping; 1, 2 and 3 in. for coupling tapping. Semiautomatic self-centering, air-operated scroll chucks. Hill Acme Co., 6400 Breakwater Ave., Cleveland 2.

Acorn: Babbitt metal. A. W. Cadman Mfg. Co., 2800-2812 Smallman St., Pittsburgh.

Acorn: Firebrick. Pacific Clay Products, 306 West Ave., Los Angeles 26.

Acorn: Foundry requisites. Goehringer Foundry Supply Co., Inc., Cincinnati.

Acorn: Wiring devices. Harvey Hubbell, Inc., 1930 Thomas St., Bridgeport, Conn.

Acorn: Dies and holders. Greenfield Tap & Die Corp., 39 Sanderson St., Greenfield, Mass.

Acorn Aluminum Babbitt: Tin with copper and antimony, for bearings, main and crank pin bearings for heavy engines. Cadman Mfg. Co., 2816 Smallman St., Pittsburgh.

Acragage: Gages. Clapp Instrument Co., 10 Tracy Ave., Webster, Mass.

Acratherm: Thermostats. Brown Instrument Co., 4496 Wayne Ave., Philadelphia 44.

Acrawax C: Synthetic wax (cetyl acetamide) used in mold lubricants for metal powder pressing. Glyco Products Co., 232 King St., Brooklyn.

Acro: Liquid grinding compound. Acme Refining Co., 3591 W. 56th St., Cleveland.

Acroetch: Etched name plates. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acrofibe: Fibre name plates. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acrolite: Grinding wheels for steel and iron. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis 9.

Acromark: Name and number plates. Acromark Co., 7-15 Morrell St., Elizabeth 4, N. J.

Acromarker: Marking machine. Acromark Co., 7-15 Morrell St., Elizabeth 4, N. J.

Acroplac: Plastic name plates. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acroprint: Plastic printed name plates. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acrostamp: Steel stamps. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acrotool: Hammer stamp. Acromark Co., 915 Morrell St., Elizabeth 4, N. J.

Acryl: Pickling inhibitor. Turco Products, Inc., Los Angeles 54.

Acryloid: Thermoplastic transparent adhesives. Rohm & Haas Co., 226 W. Washington Sq., Philadelphia.

Actalyte: Buffered solution, containing neither cyanide nor chromate, used in preparing a metal stripping bath for the removal of coatings of copper from steel, nickel, chromium and aluminum. American Chemical Paint Co., Ambler, Pa.

Actare: Pure Fe or low-alloy steel welding electrode for sheet metal. American Agile Corp., 5806 Hough, Cleveland.

Acto: Motor fuels and lubricants. Stanco, Inc., Chemical Products Div., 26 Broadway, New York.

Actron: Rectifier tubes and other electronic devices. Allis-Chalmers Mfg. Co., Milwaukee 1.

Actusol: Grease emulsifier. Du Bois Soap Co., 1120 W. Front St., Cincinnati.

A-R Mix: Air-setting plastic refractory for surfacing eroded furnace walls, ladle repairs, patching cupolas and spouts. Quigley Co., Inc., 527 Fifth Ave., New York 17.

A-R Steel: Carbon-manganese abrasion-resisting steel to combat wear and friction: for chutes, conveyors, dredge buckets, screen plates, etc. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30.

A-3 Chrome Ore: Ground chrome ore for furniture maintenance and laying basic brick. E. J. Lavino & Co., 1528 Walnut St., Philadelphia 2.

A W Super-Diamond: Steel floor plates. Alan Wood Steel Co., Conshohocken, Pa.

Adacast: Castable refractory. Botfield Refractories Co., 777 S. Swanson St., Philadelphia.

Adahearth: Monolithic hearths. Botfield Refractories Co., 777 S. Swanson St., Philadelphia.

Adalloy: Castings. Adirondack Foundries & Steel, Inc., Shaker & Jones, Watervliet, N. Y.

Adalox: Abrasive paper and cloth. Behr-Manning Corp., 1933 Sidford St., Troy, N. Y.

Adalox: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Adamant: Fire brick cement, dry (cold and heat set) cements. Botfield Refractories Co., 777 S. Swanson St., Philadelphia.

Adamant: Babbitt metal. Magnolia Metal Co., 120 Bayway, Elizabeth, N. J.

Adamantine: Alloy steel castings. Babcock & Wilcox Co., 87 Liberty St., New York 6.

Adamite: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Adamite: Low-alloyed high-carbon steel for press dies, rolls, mill guides and furnace parts. Mackintosh-Hemphill Co., 9th & Bingham Sts., Pittsburgh 3.

Adams: Arc welders. Allied Weld-Craft, Inc., South & Missouri Sts., Indianapolis.

Adams: Lubricating systems, grease guns, etc. Adams Grease Gun Corp., 54 W. 21st St., New York.

Adams: Wear and shock-resistant hard-facing electrodes. J. D. Adams Mfg. Co., 219 S. Belmont Ave., Indianapolis.

Adapatch: Plastic refractory. Botfield Refractories Co., 777 S. Swanson St., Philadelphia.

Adapt-a-Lite: Various types of portable and adjustable electric lights. Appleton Electric Co., 1701 Wellington Ave., Chicago 13.

Adaptall: Enamels. Waterproof Paint & Varnish Co., Watertown, Mass.

Adco: Firebrick. Brighton Fire Brick Co., New Brighton, Pa.

Adelco: Paints, enamels, etc. Adelphi Paint & Color Wks., Inc., Ozone Park, N. Y.

Ad-El-Ite: Paints, enamels, etc. Adams & Elting Div., Glidden Co., 1840 N. Le Calire Ave., Chicago.

Adelphi: Paints, enamels, etc. Adelphi Paint & Color Works, Inc., Ozone Park, N. Y.

Adelphia: Paints. Paramount Paint & Varnish Co., Inc., 141 League, Philadelphia.

Adhero: Paints. Jas. B. Sipe & Co., Inc., 3300 Bayliss St., Bridgeville, Pa.

Adheso: Bronze-plated wire. Johnson Steel & Wire Co., Inc., 51 Wiser Ave., Worcester.

Adjust-A-Cold: Electrode holder. S-M-S Corporation, Harper, Rivard & Sieger Sts., Detroit.

Adjusta: Blast guns. Homestead Valve Manufacturing Co., P. O. Box 82, Coraopolis, Pa.

Adjusto-O-Feeder: Proportioning pump. Proportioneers, Inc., 85 Codding St., Providence.

Adjustohm: Vitreous enameled resistors. Ward Leonard, 31 South St., Mt. Vernon, N. Y.

Adjustoweld: Welding goggles. Safety Equipment Service Co., 223 Rose Bldg., Cleveland.

Ad-Lea-Sive: Grinding wheel glue. Lea Mfg. Co., Waterbury, Conn.

Ad-Life: Conditioning process for high-speed cutting tools to increase life and cutting quality. Perfection Tool & Metal Heat Treating Co., 1740 W. Hubbard St., Chicago 22.

Admiral: Enamels. Peerless Paint Mfg. Co., Appleton, Wis.

Admiro: Complex copper alloy with 35 Zn, 15 Ni and Al-Mn-Fe for turbine bearings. Allgemeines Deutsche Metallwerk, G.m.b.H., Berlin, Germany.

Advaloy: Permanent-mold castings. Advance Aluminum Castings Corp., 2744 W. 36th Pl., Chicago 32.

Advance: Babbitt metal for bearings. United States Reduction Co., Melville & Pahnke Aves., East Chicago, Ind.

Advance: Electrical resistance wire for electrical measuring instruments, radios, rheostats, thermocouples, etc. Driver-Harris Co., Harrison, N. J.

Advance: Polishing wheels. Advance Polishing Wheels, Inc., 844 W. 49th Place, Chicago.

Aeonite: Nickel-copper white metal for sanitary appliances. Shanks & Co., Ltd., Barrhead, Scotland.

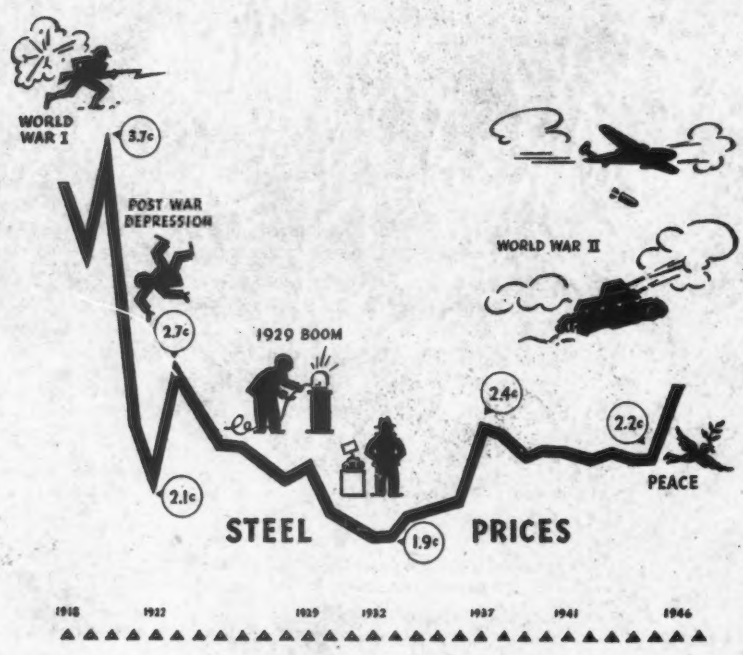
Aeral: Aluminum alloy with 4 Cu, Mn-Mg: for airplane parts and fittings. Comp. des Alliages Speciaux d'Aluminium, Asnieres, France.

(Continued on Page 248)

• In order to assure the accuracy and completeness of this directory, manufacturers and suppliers serving the metalworking industry are requested to check the trade names appearing in this and succeeding issues and to advise THE IRON AGE of any omissions or errors. These changes will be incorporated in the first reprint made for general distribution. Communications should be addressed to THE IRON AGE, 100 E. 42nd St., New York 17. Attention Trade Name Directory.

PRICES AND PRODUCTION

Past experience often indicates future trends. The statistical history of the iron and steel and nonferrous metal industries is presented herewith as an aid in appraising the violent fluctuations of 1946's prices and production against other years of equally drastic movements. It may also serve as a basis for projection of possible future trends. The prices and production data given herein cover major items and activities. More detailed information may be found in the regular weekly news and market section.



By JOHN ANTHONY
Eastern Regional Editor
THE IRON AGE

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United States Pig Iron Production

Includes ferroalloys made in blast furnaces, but excluding charcoal iron (thousands of net tons)

Source: 1901 *to* 1942, THE IRON AGE, *October* 1942 *to* 1946, *AISI*

	Jan.	Feb.	Mar.	April	May	June	First Half	July	Aug.	Sept.	Oct.	Nov.	Dec.	Second Half	Year
1901	1301	1270	1433	1408	1500	1476	8,388	1523	1496	1456	1548	1526	1418	8,967	17,355
1910	2922	2685	2932	2782	2677	2537	16,535	2407	2360	2303	2344	2139	1991	13,544	30,079
1911	1971	2011	2433	2314	2121	2004	12,854	2008	2158	2214	2355	2240	2288	13,263	26,117
1912	2305	2352	2694	2660	2815	2734	15,560	2700	2813	2760	3013	2947	3116	17,349	32,909
1913	3130	2896	3096	3083	3161	2945	18,311	2867	2852	2807	2852	2501	2222	16,101	34,412
1914	2111	2115	2630	2542	2344	2148	13,890	2193	2234	2109	1992	1700	1698	11,926	25,816
1915	1793	1887	2312	2370	2535	2667	13,564	2871	3114	3195	3501	3401	3587	19,669	33,233
1916	3567	3458	3740	3614	3764	3596	21,739	3611	3589	3586	3930	3710	3559	21,985	43,724
1917	3529	2963	3642	3735	3827	3662	21,358	3743	3638	3510	3699	3591	3229	21,410	42,768
1918	2701	2596	3599	3683	3861	3723	20,163	3832	3796	3828	3904	3757	3846	22,963	43,126
1919	3699	3293	3461	2775	2361	2369	17,958	2721	3072	2787	2087	2679	2949	16,295	34,253
1920	3377	3337	3781	3068	3344	3409	20,316	3435	3525	3504	3688	3287	3029	20,468	40,784
1921	2705	2169	1788	1336	1368	1193	10,559	969	1069	1104	1396	1585	1847	7,970	18,529
1922	1842	1826	2280	2321	2583	2644	13,496	2694	2034	2278	2956	3191	3457	16,610	30,106
1923	3617	3353	3947	3976	4332	4117	23,342	4119	3864	3501	3527	3241	3272	21,524	44,866
1924	3382	3441	3883	3622	2929	2269	19,526	1999	2114	2299	2774	2811	3318	15,315	34,841
1925	3774	3600	3992	3650	3283	2995	21,294	2984	3030	3052	3386	3386	3640	19,478	40,772
1926	3714	3274	3855	3864	3900	3623	22,230	3610	3586	3512	3734	3626	3461	21,529	43,759
1927	3477	3294	3901	3832	3798	3461	21,763	3305	3300	3108	3118	2966	3020	18,817	40,580
1928	3214	3248	3585	3567	3678	3452	20,744	3441	3514	3429	3779	3698	3774	21,635	42,379
1929	3855	3591	4160	4102	4366	4163	24,237	4239	4218	3918	4019	3563	3177	23,133	47,360
1930	3166	3180	3636	3564	3620	3286	20,452	2956	2827	2550	2425	2092	1866	14,716	35,168
1931	1920	1912	2276	2261	2233	1836	12,438	1639	1435	1309	1314	1235	1098	8,030	20,468
1932	1089	1080	1084	954	877	704	5,788	640	582	663	721	707	612	3,925	9,713
1933	637	621	607	699	993	1417	4,974	2007	2053	1705	1519	1215	1323	9,822	14,796
1934	1361	1416	1813	1934	2288	2162	10,974	1372	1181	1006	1065	1072	1151	6,847	17,821
1935	1654	1802	1983	1863	1934	1739	10,975	1702	1972	1990	2215	2315	2360	12,554	23,529
1936	2269	2042	2285	2693	2966	2896	15,151	2905	3037	3058	3351	3301	3489	19,141	34,292
1937	3597	3359	3875	3799	3961	3481	22,072	3919	4039	3819	3239	2248	1669	18,933	41,005
1938	1601	1454	1627	1541	1406	1189	8,818	1346	1673	1882	2298	2543	2476	12,218	21,036
1939	2436	2307	2682	2303	1924	2373	14,025	2639	2979	3224	4063	4167	4220	21,292	35,317
1940	4032	3311	3270	3137	3514	3819	21,083	4054	4238	4177	4446	4403	4548	25,866	46,949
1941	4664	4198	4704	4334	4600	4553	27,053	4771	4791	4717	4856	4703	5012	28,850	55,903
1942	4971	4500	5055	4896	5073	4935	29,430	5051	5009	4937	5237	4966	5201	30,552	59,982
1943	5137	4766	5314	5035	5178	4836	30,343	5023	5316	5226	5324	5096	5213	31,434	61,777
1944	5283	5091	5442	5251	5351	5064	31,482	5157	5210	4988	5200	4904	4998	30,457	61,939
1945	4945	4563	5228	4786	5016	4605	29,142	4801	4249	4227	3388	4026	4323	25,025	54,167
1946	2644	1148	4424	3614	2275	3682	17,807	4705	4898	4687	4815	4435	3548*	27,088	44,895

* Estimate

Steel Ingot Production

Openhearth, Bessemer and Electric Ingots and Steel for Castings—Net Tons

For data previous to 1921, see statistical supplement, THE IRON AGE, Jan. 4, 1940

Source: American Iron and Steel Institute

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
January	2,832,150	2,179,686	4,325,457	4,107,080	4,719,919	4,656,029	4,302,172	4,531,172	5,115,195	4,288,212	2,852,540	1,685,665	1,157,745
February	2,248,923	2,332,717	3,909,643	4,305,501	4,223,613	4,264,863	4,327,341	4,590,842	4,920,348	4,579,761	2,892,154	1,681,421	1,221,664
March	2,019,465	3,168,503	4,579,489	4,733,607	4,721,111	5,035,081	5,148,330	5,117,384	5,760,878	4,828,571	3,468,208	1,627,030	1,022,675
April	1,560,522	3,267,086	4,463,564	3,767,877	4,033,752	4,626,271	4,685,249	4,888,226	5,626,610	4,664,182	3,141,887	1,429,848	1,531,813
May	1,627,229	3,623,434	4,748,038	2,970,710	3,888,883	4,425,910	4,594,340	4,776,766	6,008,754	4,520,520	2,897,385	1,277,302	2,250,236
June	1,289,861	3,520,973	4,242,308	2,324,411	3,606,900	4,207,512	3,968,129	4,250,736	5,573,076	3,879,960	2,416,078	1,036,102	2,919,687
July	1,032,726	3,324,009	3,976,776	2,112,991	3,471,854	4,095,783	3,637,255	4,320,783	5,513,546	3,316,654	2,143,351	915,738	3,607,288
August	1,462,971	2,959,784	4,161,827	2,872,652	3,850,644	4,497,374	3,971,467	4,744,291	5,614,144	3,473,898	1,949,462	961,153	3,260,279
September	1,510,108	3,172,549	3,780,066	3,181,798	3,927,822	4,409,463	3,710,754	4,709,416	5,146,744	3,223,766	1,754,817	1,125,892	2,599,370
October	2,078,382	3,838,975	4,028,163	3,516,891	4,377,214	4,591,053	3,764,573	5,279,460	5,154,063	3,055,972	1,805,653	1,233,957	2,373,729
November	2,133,903	3,861,539	3,529,560	3,512,087	4,393,068	4,175,502	3,549,711	4,844,460	4,002,365	2,510,820	1,807,315	1,171,710	1,731,930
December	1,834,504	3,715,317	3,224,324	4,016,316	4,469,629	3,906,230	3,604,731	4,562,175	3,299,786	2,246,742	1,477,529	977,389	2,047,780
Total	21,630,744	38,914,072	48,969,215	41,421,921	49,684,409	52,886,071	49,264,052	56,615,711	61,735,509	44,589,058	28,606,379	15,123,207	25,724,196

	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
January	2,276,596	3,279,411	3,474,353	5,398,326	1,984,815	3,663,004	5,764,723	6,928,085	7,112,106	7,424,522	7,592,603	7,204,312	3,872,054
February	2,521,472	3,169,849	3,379,587	5,050,824	1,942,795	3,448,120	4,525,797	6,237,900	6,512,535	6,824,604	7,194,009	6,652,765	1,392,517
March	3,190,040	3,273,948	3,810,436	5,970,247	2,293,884	3,929,387	4,389,183	7,131,641	7,392,111	7,674,578	7,826,257	7,705,929	6,507,047
April	3,346,922	3,017,120	4,494,782	5,801,540	2,196,413	3,431,600	4,100,474	6,756,949	7,121,291	7,373,703	7,593,688	7,289,887	5,860,258
May	3,875,202	3,009,189	4,614,529	5,894,260	2,061,169	3,372,636	4,967,782	7,053,238	7,382,578	7,549,691	7,702,576	7,449,667	4,072,452
June	3,487,612	2,580,723	4,543,888	4,787,710	1,868,848	3,606,729	5,657,443	6,800,730	7,015,302	7,039,353	7,234,257	6,840,522	5,624,826
July	1,697,879	2,591,191	4,473,940	5,212,832	2,259,677	3,648,639	5,724,625	6,821,682	7,144,958	7,407,876	7,498,387	6,985,571	6,609,668
August	1,574,649	3,331,707	4,782,442	5,580,683	2,903,805	4,341,726	6,186,383	7,000,957	7,227,655	7,586,464	7,498,913	5,735,317	6,886,863
September	1,446,551	3,227,815	4,744,841	4,907,592	3,029,736	4,881,601	6,056,246	6,819,706	7,057,519	7,514,339	7,235,111	5,982,475	6,517,894
October	1,689,272	3,590,878	5,182,430	3,881,819	3,554,912	6,223,126	6,644,542	7,242,683	7,579,514	7,814,117	7,620,885	5,596,776	6,909,597
November	1,836,008	3,599,619	4,941,014	2,464,793	4,072,676	6,292,322	6,469,107	6,969,987	7,179,812	7,371,975	7,278,719	6,200,466	6,378,606
December	2,239,126	3,511,636	5,056,843	1,685,273	3,583,253	5,958,893	6,495,357	7,163,999	7,304,540	7,255,144	7,366,170	6,057,937	5,268,218*
Total	29,181,329	38,182,986	53,449,085	56,635,899	31,751,983	52,797,783	66,981,662	82,927,557	86,029,921	88,836,366	89,641,575	79,701,624	65,900,000

* Estimated

Finished Steel Composite Price

(cents per pound)

Source: THE IRON AGE

• • • **Weighted average of** THE IRON AGE quotations on following steel items: Hot-rolled and cold-rolled strip, sheets, bars, plates, shapes, wire rods, rails and pipe. The composite was revised in 1941 to obtain greater sensitivity in reflecting price changes. This revision was described in detail in issue of Aug. 28, 1941, p. 92. Prior to 1941, this index was computed on the basis of finished steel shipments in the 10-yr period 1929-39. The three years, 1941, 1942 and 1943, are based on annual shipments for the year. Since 1944, the index has been based on quarterly shipments. Averages on the old basis for previous years were published in the annual statistical supplement, Jan. 4, 1940.

	1929	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
January	2.27758	2.06492	2.07642	2.32263	2.58414	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444	2.54490
February	2.27758	2.06492	2.06513	2.32263	2.58084	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444	2.54490
March	2.27623	2.06492	2.05463	2.53185	2.57754	2.35367	2.30467	2.30467	2.28249	2.29176	2.27235	2.38444	2.54490
April	2.30373	2.06492	2.06220	2.58414	2.57754	2.35367	2.26015	2.30467	2.28249	2.29176	2.30329	2.42471	2.73011
May	2.30723	2.06492	2.06220	2.58414	2.56939	2.30807	2.30467	2.30467	2.28249	2.29176	2.30329	2.42471	2.73011
June	2.31773	2.06492	2.06680	2.58414	2.51300	2.28297	2.30467	2.30467	2.28249	2.29176	2.30329	2.42471	2.73011
July	2.31213	2.06492	2.13890	2.58414	2.35944	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076	2.70711
August	2.29423	2.06492	2.13890	2.58414	2.35944	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076	2.70711
September	2.28225	2.06492	2.14554	2.58414	2.35655	2.28297	2.30467	2.30467	2.28249	2.29176	2.30837	2.44076	2.70711
October	2.26950	2.07642	2.17210	2.58414	2.31964	2.28297	2.30467	2.30467	2.28249	2.29176	2.21188	2.44104	2.70711*
November	2.26498	2.07642	2.17210	2.58414	2.35367	2.28837	2.30467	2.30467	2.28249	2.29176	2.21188	2.44104	2.70711*
December	2.27750	2.07642	2.26276	2.58414	2.35367	2.30467	2.30467	2.30467	2.28249	2.29176	2.21188	2.44104	2.74466*
Average	2.28839	2.06779	2.11814	2.53620	2.45874	2.31088	2.30096	2.30467	2.28249	2.29176	2.27298	2.42277	2.67544*

* Estimate.

Steel Ingot Production

Pct of Capacity

Source: American Iron and Steel Institute

	1928	1929	1931	1932	1933	1934
January	80.33	86.56	44.59	25.88	17.76	34.32
February	87.09	92.21	50.07	26.62	20.75	42.10
March	90.73	97.48	54.21	24.98	15.68	48.09
April	89.49	98.32	50.71	22.67	24.26	52.10
May	84.69	101.68	45.29	19.61	34.51	58.42
June	77.82	97.38	39.00	16.42	46.24	54.29
July	76.78	93.51	33.58	14.09	55.45	25.65
August	84.11	95.00	30.47	14.76	50.00	23.74
September	86.42	90.14	28.39	17.89	41.26	22.57
October	93.60	87.22	28.22	18.94	36.40	25.46
November	88.69	69.94	29.17	18.57	27.43	28.58
December	81.07	55.96	23.15	15.04	31.48	33.83
Average	85.05	88.76	37.99	19.67	33.52	37.37

	1935	1936	1937	1938	1939	1940
January	49.21	52.46	81.32	29.14	52.69	83.40
February	52.68	54.61	84.26	31.59	54.93	70.00
March	49.12	57.54	89.93	33.67	56.52	63.50
April	45.75	70.09	90.24	33.70	50.97	61.20
May	45.15	69.68	88.79	30.26	48.51	71.80
June	39.99	70.85	74.47	28.33	53.57	84.50
July	39.97	67.71	78.37	33.25	52.60	83.00
August	49.99	72.22	83.71	42.63	62.45	89.50
September	50.13	74.16	76.19	46.03	72.68	90.60
October	53.88	78.26	53.23	52.19	89.52	96.10
November	55.77	77.05	38.18	61.74	93.46	96.60
December	52.81	76.53	25.34	52.72	85.91	94.10
Average	49.68	68.45	72.33	39.60	64.53	82.10

	1941	1942	1943	1944	1945	1946
January	96.90	94.5	96.8	95.7	88.8	49.6
February	96.60	95.9	98.5	97.0	90.8	19.8
March	99.70	98.2	100.0	98.6	95.0	83.3
April	97.60	97.7	99.3	98.8	92.8	77.5
May	98.70	98.1	98.4	97.1	91.8	52.2
June	98.20	96.3	94.8	94.1	87.1	74.4
July	93.40	94.5	96.2	94.3	86.3	84.9
August	95.70	95.4	98.3	94.1	70.7	88.2
September	96.40	96.4	100.7	94.0	76.3	86.4
October	99.00	100.0	101.2	95.6	69.0	88.5
November	98.30	97.8	98.6	94.3	78.9	84.4
December	98.10	96.6	94.2	92.6	74.8	67.0*
Average	97.40	96.8	98.1	95.5	83.5	71.4

* Preliminary figure, subject to revision.

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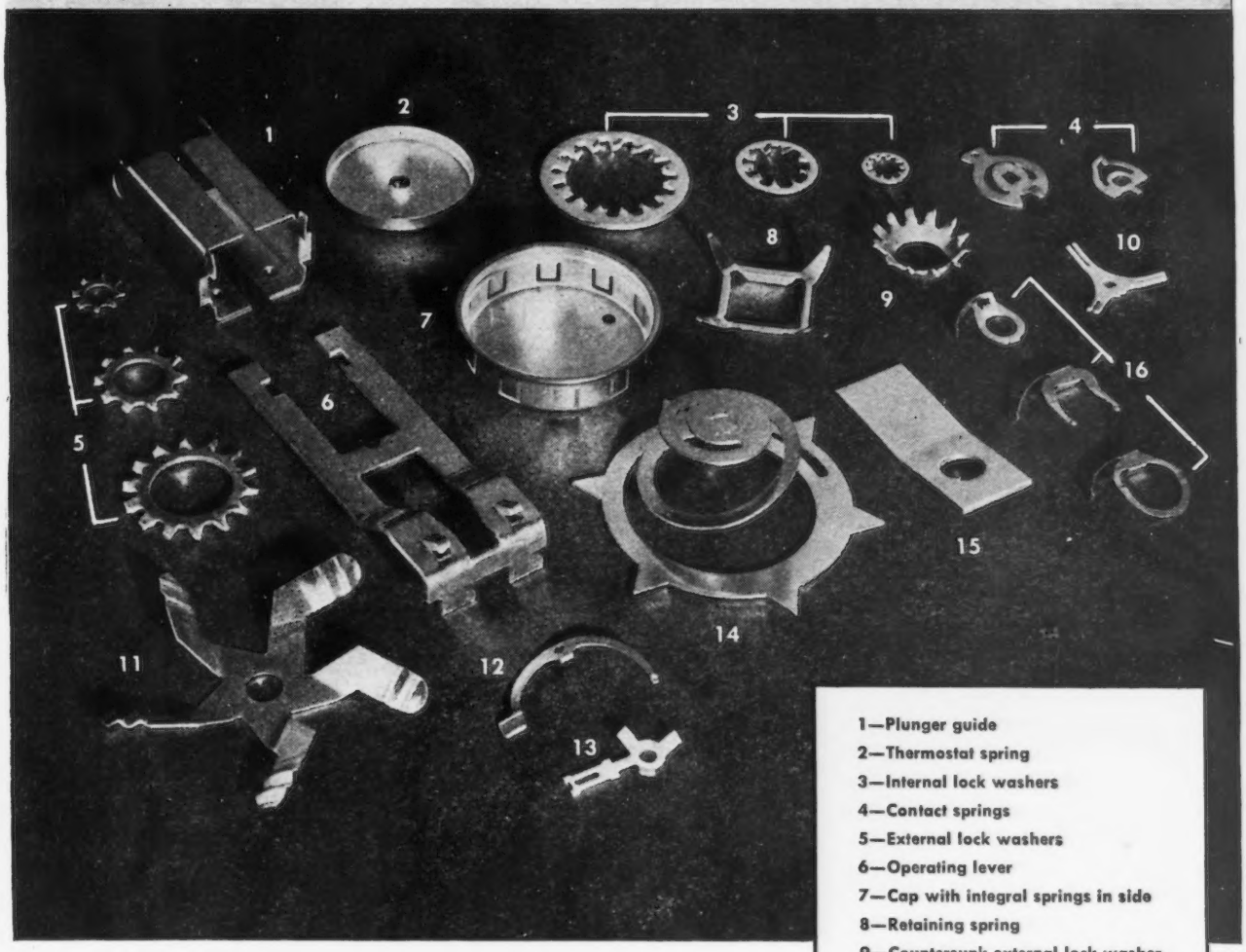

1—Plunger guide
2—Thermostat spring
3—Internal lock washers
4—Contact springs
5—External lock washers
6—Operating lever
7—Cap with integral springs in side
8—Retaining spring
9—Countersunk external lock washer
10—Pressure spring for capacitor
11—Five-contact spring
12—Contact spring for radio part
13—Pressure spring and terminal
14—Involute spring
15—Contact point for solenoid
16—Contact springs
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Assembly Line . . .

WALTER G. PATTON

• Portal-to-portal wage claims on the industry may exceed a billion dollars . . . 1947 cars go into production . . . 10,000th car comes off the Kaiser-Frazer assembly line.

DETROIT—Despite the most demoralizing strikes in its history, greater competition for raw materials than it ever knew before and aggravating government controls and regulations, the automobile industry in 1946 assembled approximately 2,150,000 passenger cars and 930,000 trucks. This is approximately 57 pct of the 1941 passenger car volume and 89 pct of the 1941 truck output.

In many respects, these figures are more promising than they appear to be. Practically all the physical reconversion problems are now out of the way; only the back-wash of labor strife and postwar price adjustments stand ahead of high volume production by the automobile industry.

The industry is now geared up mechanically to produce 5 million cars—if labor strife does not interfere during 1947. As early as June the industry is looking for new sheet steel capacity that will greatly relieve the critical steel supply problem. With the prospect of better trained workers and a much improved materials situation the industry would like to look forward to 1947 with confidence that a 5 million goal can be reached.

On the other side of the picture, however, is the threat of a twin-pronged drive by the unions to collect higher wages and several hundred million dollars in portal-to-portal wages.

The portal-to-portal wage claims are based on a decision of the Mt. Clemens Pottery case laid down by Federal Judge Frank Picard of Michigan. The Judge now says that the original litigation did not involve portal-to-portal pay at all and he is one of the most surprised members of the court that potential claims aggregating more than a billion dollars have blossomed from this court decision. The initial suit, it appears, was on a basis of overtime required but not paid for and not portal-to-portal as such.

It is small comfort to the automobile companies, however, that many of these claims, if granted, will be passed on to the government. As a matter of fact, the government will have to carry the bulk of the triple damages if awarded. Suits aggregating $500 million have already been filed by the union; the Ford suit alone is for $270 million.

What is more immediately damaging to the automobile industry than the actual claims for portal-to-portal wages is the fact that the suit gives the union a double edged cleaver it can use in driving forward its wage plans. Many observers here believe that the union is more grateful to the portal-to-portal suits as an additional basis for implementing its wage drive than for the possibility of collecting millions in damages from several hundred Michigan manufacturers.

ONLY simple changes will be made in the 1946 cars to convert them to 1947 models. Cadillac expects to begin production of its 1947 models this week without interrupting its assembly line. Buick plans to complete its present model run late in December. After a short closing for inventory the new model is scheduled to go into production on Jan. 13.

The year-end will also see the wind-up of production on the 1946 Pontiac model; it is expected that 1947 Pontiacs will come off the line not later than Jan. 15.

Chevrolet expects to close for a week during January, and Oldsmobile is holding its inventory change to a period of a few days shortly after the end of the year. The changes in General Motors cars will be confined to radiator grilles, decorations, trim, etc.

Both Hudson and Nash expect to start production of 1947 models before the end of 1946. Except for legal holidays, Chrysler and Studebaker will probably operate on the usual 5-day schedule. Kaiser-Frazer closed for three days during Christmas week.

Model changes are not involved insofar as Chrysler, Studebaker and Kaiser-Frazer are concerned.

Ford and Packard operations will not be immediately affected by model changes. Ford plans to introduce a slightly altered 1947 model this spring while Packard has a 1947 model that is "new from the tires up." Introduction of the new Packard is also scheduled for this spring.

However, in addition to curtailed production relating to new model activities, there have been actual automobile plant shutdowns for lack of materials. Ford laid off 90,000 employees from Dec. 24 to Jan. 2 and Hudson made idle 12,000 production workers during the last week in December. Critical shortages of rolled steel and castings, resulting from the coal strike, are blamed for the shutdowns.

ON Nov. 15 the 5000th Kaiser-Frazer car came off the final assembly line at Willow Run; exactly one month and a day later the 10,000th automobile was completed. Peak production for a single day during the past few weeks was 319 units.

Incidentally, seven of the 21 new body presses are now installed and operating at Willow Run and the present schedule calls for the remaining 14 to be operating shortly after the first of the year.

A new body paint repair section is in use and work has been completed on two front end assembly carrousels and two cushion assem-

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bly carrousels. Both of these are balcony operations.

A number of automatic equipment installations must be completed before the No. 2 assembly line can operate at capacity. The majority of these installations are welding equipment for body subassemblies.

Also in the construction stage are sections of the second chassis line, an instrument panel carrousel and conveyor equipment for the body bank and body drop and additional propane gas facilities.

An innovation in the Willow Run setup is a new paint repair section that eliminates the necessity of "paint rejects" going all the way back to the west end section and then traveling the entire length of the line again. Under the K-F plan, faulty paint spots are "masked off" with paper, sprayed in the new paint booth and baked in a drying oven.

Seat and back cushions are being built on two cushion assemblies on the "G" balcony. Jigs compress the springs while cushion fabrics are attached. When the pressure is released, the springs snap back to their original shape, pulling the material tight and eliminating wrinkles.

Kaiser-Frazer engineers are now experimenting with a new type balloon assembly fixture, it is reported. According to J. E. Cronan, chief layout engineer, if experiments are successful K-F will be able to build the entire balloon assembly with the exception of the floor pan in a single operation.

The K-F chassis line now under construction will differ somewhat from the present line. Following the frame turn-over operation, an overhead monorail will pick up the chassis and carry it along the line. This operation is said to eliminate breakdown trouble and make it easier for workers to move around the chassis.

Body drops are now being made from the new body bank balcony, but the incline conveyor to the body bank and the floor conveyors in the balcony itself have not been completed. The body bank plus feeder lines and the incline conveyor will have a capacity of 92 bodies. Work is said to be well under way on the construction of additional propane gas facilities.

Kaiser-Frazer is not the only automobile producer turning out cars from a plant built for bombers. Since early in October the Buick-Oldsmobile-Pontiac assembly plant in Kansas City has been assembling all the Buicks, Oldsmobiles and Pontiacs, including their Fisher bodies, distributed in the Midwest. Originally built to assemble B-25's, reconversion work was started shortly after VJ-Day and the plant is now employing 2000 persons. As many as 3000 employees can be used on a one-shift operation.

The Kansas City "B" plant sprawls on a 100-acre tract. Approximately 1,600,000 sq ft of floor space or nearly 40 acres are included in the building. The section of the plant which was used for the final plane assembly has a bay 300 ft wide, 1050 ft long and nearly 80 ft high in the center. There is not a column inside the entire area and trusses are 45 ft above the floor. This is the section now being used for final assembly, testing and shipping lines by B-O-P.

Body assembly begins at the opposite end of the plant. Nearly 8 miles of conveyors wind over the floor of the building. The 1315 ft body conveyor is suspended nearly 40 ft above the floor, running down from this level like a roller coaster to the final assembly line. Throughout its length, the body assembly system will accommodate 1000 bodies simultaneously.

Built as a blackout plant, the building is completely air-conditioned. There are no windows in the manufacturing area and illumination is provided entirely by rows of fluorescent tubing.

It has often been suggested that an ideal automobile plant is simply a gigantic machine tool, every part of which has been carefully designed and engineered to contribute toward the end-product of the plant. Undoubtedly the low cost of government-built plants makes them attractive to many manufacturers. It remains to be seen whether a comparatively low plant investment will offset any lack of efficiency resulting from the fact that the building was originally designed to produce airplanes and not automobiles. Apparently both Kaiser-Frazer and General Motors are betting that the barriers met in converting some aircraft plants to automobile assembly plants are not insurmountable from an economic standpoint.

Purchases Blast Furnace

Washington

• • • **The American Steel & Wire Co.** has purchased for $1,835,000 the government-owned blast furnace and equipment at Duluth, Minn., which the company operated during the war. The furnace has a rated annual capacity of 266,000 tons. The furnace was erected originally in Joliet, Ill., in 1904 and was rebuilt in 1923 and shipped to Duluth in 1942. The boiler plant servicing the furnace was constructed in 1923 in Anderson, Ind., and it was also shipped to Duluth.

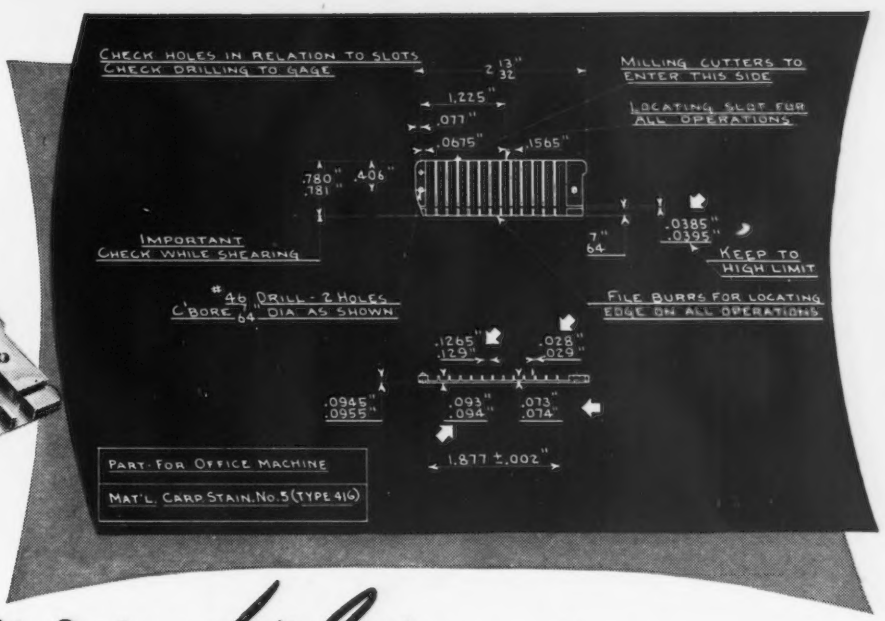
WAA said that the cost of facilities to the government was $7,601,556 but that the current appraised economic and utilization value is $2,025,577. The government surplus property agency also stated that operation of the furnace by a company other than American Steel & Wire was impossible because the furnace depends upon stockpile, utility and repair facilities owned by the purchaser.

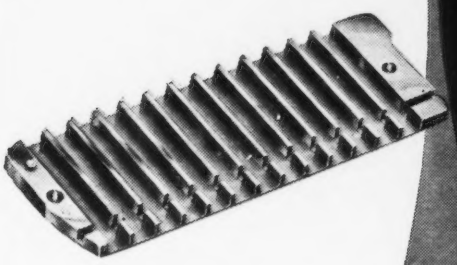
GM Leases Aircraft Plant

Chicago

• • • **General Motors Corp.** has leased the aircraft plant formerly operated by the Pullman-Standard Mfg. Co. during the war. The rent per year for the plant located at 900 E. 103rd St., Chicago, is $277,700, the lessee paying taxes, maintenance and insurance. Five main buildings and several accessory buildings are included in the lease. The lease runs to Dec. 15, 1951, with options for expansion granted for a period of 5 yr on a year-to-year basis, subject to certain mutual rights of cancellation. Of the 800,000 sq ft total floor area, GM officials say that 700,000 sq ft will be used by electromotive division for manufacturing parts and subassemblies for diesel locomotives and accessories. Sheet metal work, including welding and fabrication of components for the diesels, will be done at the plant. It is expected that 2500 men will be employed in this plant by the fall of 1947.

Drilling and milling to these close tolerances was once a prize headache But now each operation is done faster because of the *consistent uniformity* of Carpenter Free-Machining Stainless No. 5.





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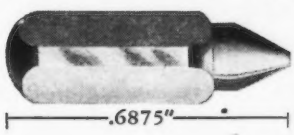

The point on this carburetor needle is made to close tolerances and the needles are produced economically, thanks to the easy machining properties of Carpenter Stainless No. 5. The special cold drawn shape as supplied from the mill also reduced the total amount of machining needed on the job.

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Washington . . .

L. W. MOFFETT

• Reshaping of corporate tax structure in prospect . . . Changes may not be made until 1948 . . . Treasury discusses double taxation . . . No recommendations made.

WASHINGTON—The need for revision of the existing corporate tax structure has been obscured in recent months by the widespread publicity given to anticipated reductions in personal income tax rates.

Admittedly a dull but an extremely important subject, corporate taxes are also in for a going over by the new Congress, although there is a possibility that any changes in the existing laws may not become effective until 1948.

The chief criticism leveled at existing corporate income taxes is that they are inequitable and do not encourage investment.

While officials in the Treasury Dept. may not agree with the contention that the present corporate tax structure leaves much to be desired, it is quite evident that they are also convinced that changes are in the wind.

The Treasury's views and suggestions for change are set forth in a recent technical staff study on the postwar corporation tax structure. Part of the department's continuing study of postwar tax revision, the report centers on the problem of the so-called double taxation of distributed corporation profits. In advancing specific proposals for reducing or eliminating this double taxation, the report did not recommend any of them and found flaws in all of them.

While the foreword to the report carefully explains that it "advances no policy recommendations but discusses considerations important to the formulation of such recommendations," there is a definite undercurrent throughout the report which seems to indicate that the Treasury Dept. is opposed to any changes in the system of double taxation.

ELIMINATION of the corporate tax without any other change is hardly ever suggested as a remedy for double taxation, the report states, because such a move would open the way for stockholders to postpone or avoid taxes on their shares of undistributed profits. One approach, however, would completely eliminate double taxation of distributed corporate profits, and would rely on taxation of realized capital gains at regular individual rates to prevent tax avoidance with respect to undistributed profits. But, the report states, undistributed corporate profits would be taxed less heavily than other income. This approach, says the Treasury Dept., would favor corporate savings and internally financed investment as compared with consumption and noncorporate saving and investment and "would be likely to bring economic disadvantages as well as inequities."

Complete integration of individual and corporate taxes could be achieved, according to the report, by determining tax liability on corporate profits without regard to the legal distinction between corporations and stockholders. The partnership method would tax stockholders currently at their regular personal tax rates on both distributed and undistributed profits. This approach would completely eliminate double taxation, individual tax postponement, and tax discrimination against equity financing, but, in the words of the Treasury, "it probably would not be feasible for large corporations with complicated capital structures and a large number of shareholders."

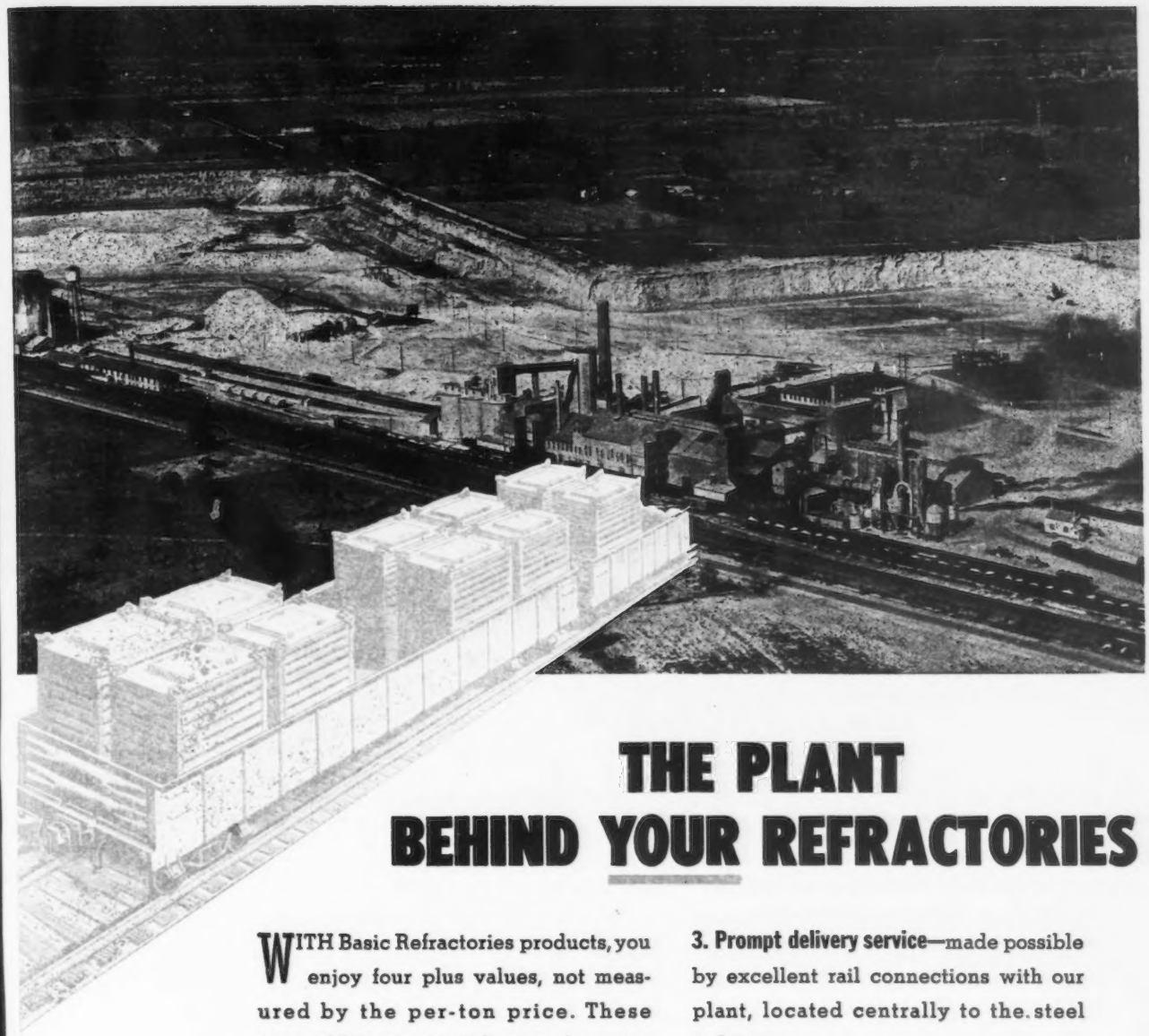
Another approach to coordination would be to give corporations a tax credit or deduction from taxable income for dividends paid. This approach would keep a tax on undistributed profits but would reduce or eliminate the corporate tax on distributed profits. This dividends-paid-credit plan could completely or partially eliminate double taxation, remove or lessen tax discrimination against equity financing, and reduce the weight of taxation on corporate profits.

The fourth basic approach, suggested by the report, calls for adjustment of the individual tax of stockholders to take account of the tax paid by the corporation. Three specific approaches are included under this general plan.

THE withholding approach would consider part or all of the corporate tax a withholding tax. When stockholders received dividends they would be taxed on the cash received plus the withholding tax allocable to their dividends, but would get a tax credit for the withholding tax and in cases of overwithholding, they would be given refunds. This system, used in England, would be similar to the present withholding system for salaries and wages. While this plan could eliminate double taxation, according to the Treasury, it would present some "rather serious administrative problems."

The remaining plans would (1) exempt dividends from a substantial individual normal or first-bracket tax rate or to give stockholders an equivalent tax credit, or (2) exclude a part of dividends from individual taxable income and tax the remainder at regular individual rates.

However, these approaches would give no relief to stockholders not subject to individual income tax, states the report, and would offer considerable benefits to wealthy stockholders, since in effect a part



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of the corporation's tax payment would be applied to their personal tax liabilities but would not be included in their taxable income. Continuing, the report says that these approaches would do little to counteract possible undesirable effects of the corporate tax on management policies as to investment, prices, and wages.

WHILE complete equality of taxation of distributed corporate profits and other kinds of income could be achieved by any of these four basic approaches, according to the Treasury report, only the "partnership approach or some variation of it could tax undistributed corporate profits in exactly the same way as other kinds of income. Specific versions of the third and fourth basic approaches may aim at reducing inequalities of taxation of corporate profits and other kinds of income rather than at complete equality of taxation.

"Starting from approximately the present relation between corporate and individual tax rates, all approaches to coordination of individual and corporate taxes would be likely to result in some loss of revenue. Generally, the more nearly 'complete' the coordination or integration, the greater would be the loss of revenue." The loss of revenue is estimated at $800,000,000 to $1,400,000,000.

Finally, the Treasury suggests that corporate tax adjustment be spread over a number of years, so as to eliminate the possibility of a windfall to some stockholders and a speculative stock market boom.

Steel Consumption By Railroad Locomotive Industries Estimated

Washington

• • • **The railroad and** street cars industry and the locomotive and parts industry in the second quarter of 1946 consumed carbon steel at the rate of 1,291,292 net tons and alloy steel at the rate of 70,984 tons annually. These estimates are based on reports to the Bureau of Census for June, received on Form CPA-732. Reports from the railroad and street cars industry were received from 53 plants and from 23 plants in the locomotive and parts industry. They are estimated to account for nearly 100 pct of each industry.

The railroad and parts industry embraces plants which during the first half of 1946 were engaged primarily in the manufacture of passenger, dining and freight cars, street cars, trolley buses, and railroad and street car parts. The locomotive and parts industry includes plants which during that period were engaged primarily in the manufacture of diesel, electric and steam locomotives and parts.

Shipments by the railroad and parts industry in June were valued at $28,432,000 and carbon steel and alloy steel consumption in the second quarter was 227,683 tons and 12,321 tons, respectively. Shipments by the locomotive and parts industry in June were valued at $28,407,000. Carbon and alloy steel consumption during the second quarter was estimated at 95,140 tons and 5425 tons, respectively.

To Drop Subsidy On Convector Radiators

Washington

• • • **Premium payments** by the NHA for production of convector radiators may be dropped on the first of February, according to indications here. Instituted last July, the payments were due to expire on Dec. 31 but have been temporarily extended 30 days by Housing Expediter Frank R. Creedon.

The issue will be decided on Jan. 7 at a meeting of NHA officials and members of the Convector Radiator Industry Advisory Committee.

Prior to lifting of price control last November, the committee had recommended a 6-month extension of the subsidy program. With the aid of the bonus payments, Mr. Creedon said, monthly output has been boosted by about 150 pct.

In a move apparently aimed at restoring production of building materials to a free market basis, Mr. Creedon has announced that premium payments on hardwood flooring will end as of Dec. 31. They were originally scheduled to run till Apr. 30.

Since they differed from the usual premium payment plans in that they represented a pass-through bonus to log suppliers, no good purpose could be served in their continuance past the end of the year, the housing expediter said.

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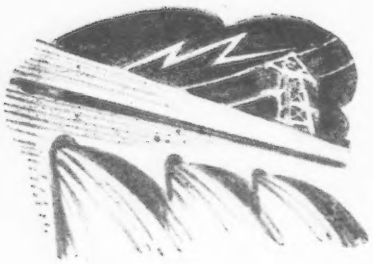
ROBERT T. REINHARDT

• Western industry looks for record year involving battles for steel markets which may bring the long-sought "cheaper steel."



SAN FRANCISCO—Western industry begins the new year with considerable optimism even though confronted with the same difficulties found throughout the rest of the country. This outlook is based upon the increasing demand for consumer goods brought about by the tremendous increase in population; stimulated production of durable goods; and the greatest production of iron, steel and aluminum in its peacetime history.

Biggest western industrial news of the past year was, of course, the purchase of the gigantic Geneva steel plant by U. S. Steel Corp. which set the stage for what may become a battle between David and Goliath, the outcome of which no one has the temerity to suggest, but there is some doubt that the Biblical denouement will be repeated.

With western steel capacity at an all time high for peacetime economy, the long looked for "cheaper steel" still seems to lie in the dim distant future. The basing point prices established at Geneva and the recently announced increases on basic products by the Kaiser Co., Inc., have done nothing to bring this mirage any closer. Nonetheless, steel users are realistic and believe as soon as the forces of competition become fully active once more, especially in light rolled products, some degree of pricewise relief may be afforded.

Future plans of U. S. Steel Corp. in the West will be watched with considerable interest. Many questions are being asked as to the policy of this organization in regard to acquisition of additional fabricating plants in the West. Purchase of Consolidated Steel Corp., announced last month, is believed by many to be a harbinger of similar actions. Some observers think that this is the corporation's strategy to insure a market for a large part of its production at the Geneva plant, and possibly to make the going just a little tougher for some of the competition.

There is little factual support for this theory on the surface and it is pointed out that it is not precedent breaking for an organization of that size to control outlets for its finished and semifinished products. It is known that Bethlehem Steel Co. owns or controls at least one-third of the stock of the Rheem Mfg. Co. which insures an outlet for steel sheets. The American Rolling Mill Co. now has complete control of several corrugated and welded pipe manufacturing plants in the West. Kaiser Co., Inc., at Fontana is still without satellite consumers but there is ample evidence to believe that if the financial structure of that company was to be improved by a readjustment of the RFC loan that it too would seek to control at least a portion of its market by purchase or operation of fabrication plants. The closest approach to such a condition today is the relation between Kaiser-Frazer and other industries in which Henry J. Kaiser has a hand and his Fontana plant.

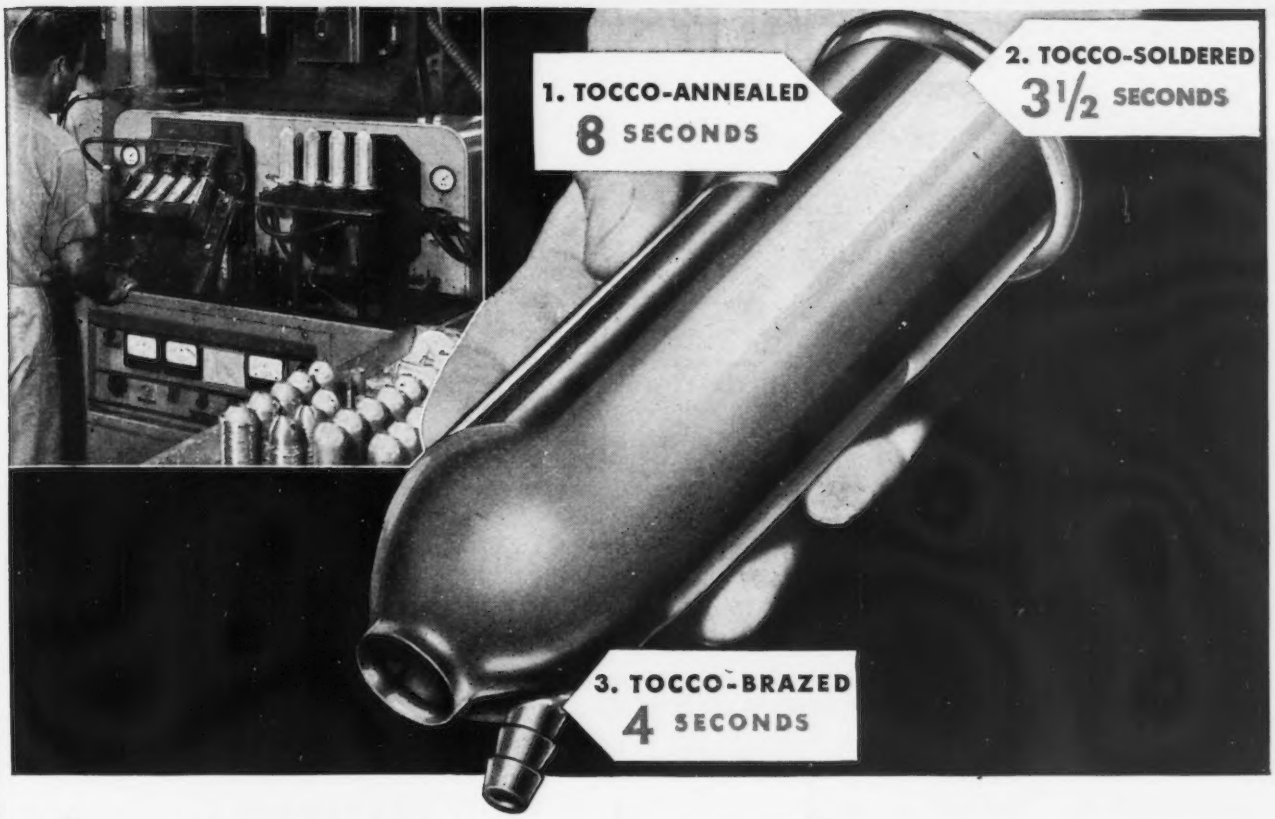
INTEREST in two steel plants proposed during the past year—one in Los Angeles and the other in Seattle—has apparently cooled somewhat and nothing indicates they are to be brought into being in the near future. Both of these projects were announced at the depth of the sheet shortage in the West when tempers were hot and sheet fabricators faced closure or were at least cut in production to a point where it was practically impossible to more than break even. In both projects economic studies were to have been made to determine feasibility and while no statement has come from the promoters, it is believed that the competitive situation is such as to discourage the investments necessary. The shadow of Geneva is long, and while it is conceded that production of sheets there will not be a reality for at least a year and a half or two years, it is quite likely that the potential breadth of large-scale production in a modern mill has clipped the wings of some of the would-be independents.

Nonferrous metal production in the West has been seriously curtailed through strikes and an unsatisfactory pricing condition. Utah copper production for the first 9 months of 1946 was less than one-third of production for the corresponding period of 1945. The major factor contributing to that drop was the strike against the largest operators in the first half of the year and the manpower shortages after the strike was settled.

Utah copper output for the first 9 months of 1945 was reported at 354,428,000 lb and the corresponding period of 1946 only 114,060,000 lb. Production of other nonferrous metals in this same area dropped sharply but not so much as copper because the strike was not imposed against a group of companies whose production was chiefly lead, zinc and silver. Comparing 1945 figures with 1946 production: Lead, 62,910,000 lb and 37,000,000 lb; zinc, 51,296,000 lb and 37,360,000; silver, 4,700,000 oz and 2,434,000 oz; gold, 214,338 oz and 85,650 oz.

In the Pacific Northwest the recent increase in the price of lead has stimulated production and large-scale development programs. Most of the larger mines in the Coeur d'Alenes have been hiring miners since they returned to the 6-day work week and production consequently is gradually increasing.

Lead went higher than it has been since the Civil War when the



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SPEEDY HEATING. This localized process performs these operations speedily . . . for *lower costs:* (1) Heats upper end to 1950° F. in 8 seconds . . . anneals it for shaping end flange. (2) Heats upper end to 400° F....4 at a time in 14 seconds...to solder-fill curled flange. (3) Heats nipple connection to 1100° F. . . . 4 at a time in 16 seconds . . . to silver solder nipple to cup.

SPEEDY HANDLING. Cool, clean, compact, TOCCO machine is located in production line handy to related operations. Minimizes haulage . . . for *lower costs.*

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American Smelting & Refining Co. set a price of 12.55¢ a lb. The average price during the past few years has been 6.5¢ a lb.

SEATTLE—The black mineral is receiving unusual attention at this time in the Tacoma area where the surplus Wilkeson coke plant has been put on the block by the WAA.

The plant covers 6½ acres of land on the Tacoma waterfront. Built during the war, these facilities would produce 75,000 tons of coke, 900,000 gal of tar and 400,000 cu ft of gas per year. The coal mines which are also to be sold or leased are located near the town of Wilkeson, about 40 miles south of Tacoma. These deposits are estimated to contain a 100 million ton reserve.

The coke produced from this Washington coal has generally been considered inadequate for metallurgical purposes. During the war this plant operated at capacity and supplied the Northwest with a considerable quantity of coke for fuels.

Bids were opened in this city on Dec. 30.

In the face of a falling off in demand for smaller aircraft, Boeing Aircraft Co. has suspended its program to produce model 417 local service transport which was specifically designed for operating economy and utility on regional airlines and all lines making frequent local stops.

This project was still in the engineering stage and production had not started when it was dropped. The original surveys indicated a market of sufficient size to support a large production schedule of this lighter ship but the present market is so limited it would not sustain an economic production program. The principal cause for the drop in interest for these lighter ships is given as the reluctance of the Civil Aeronautics Board to issue certificates for new feeder lines and the fact that these are being granted on a temporary, 3-yr basis.

Boeing is increasing its personnel steadily and is concentrating on the production of four-engine planes such as the twin-deck Boeing Stratocruiser for major airlines; the Boeing B-50, a new high performance bomber; and the development of several new military planes.

PORTLAND — A shipbreaking firm under the sponsorship of the Zidell Machinery Co. to be known as the Zidell Ship Dismantling Co., and including the Gilpin Construction Co. and the Oregon Steel Mills, has been reported as the high bidder for a portion of the Commercial Iron Works property.

This company's bid of $16,567 per year for a 2-yr lease was approximately double that of the only other bidder, the Dulien Steel Products Co., Inc., of $8,706 per yr.

Zidell entered the shipbreaking picture recently through the purchase of six aircraft carriers and two subchasers and under the presently contemplated arrangement, Oregon Steel Mills would stand to benefit by a steady flow of scrap if this bid is approved by the WAA. Dulien Steel Products Co., Inc., is a well established and recognized scrap dealer in the West and this organization had contemplated employing 60 to 75 men in this project if they were successful bidders.

The Commercial Iron Works was established in 1916, and in July of 1946 the privately-owned facilities of this company were offered for sale. The portions of the property offered for sale by the WAA include the four shipways, gantry and bridge cranes and a large number of buildings housing machine tools and other facilities, believed to be ideally adapted to shipbreaking operations.

October Shipments By Manufacturers Reach Record $12.5 Billion

Washington

• • • **Shipments** by manufacturers during October totaled nearly $12.5 billion, up $2 billion over a year ago and representing the best monthly rate since VJ-Day, it is reported by the Dept. of Commerce.

At the same time, it was revealed that manufacturers' inventories had risen $3 billion above book values of October, 1945. A third of the increase was in finished goods, distributed about equally between durables and nondurables; most of the remainder was represented in materials.

Shipments by the iron and steel group, the report said, remained fairly stable during the year except during the steel strike earlier in the year. Strong demand has kept inventories low and October shipping was approaching that of early 1945.

On the other hand, a rapid rise was recorded in shipping for the nonferrous industries. This was attributed largely to the change in nature of products. Output of light metals for armaments has been changed to highly fabricated products for civilian use.

Total manufacturing inventories held at the end of October amounted to more than $19.5 billion, an increase of $670 million over September. A large share, some 45 pct, was in the form of finished goods. The value of goods in process rose more than $400 million during the year.

Every major industry group shared in the rise. The rise in durable goods holdings bulked largest in machinery.

A very marked rise was also noted in total sales volume during October which carried the month's sales aggregate to a record high monthly rate of $34.7 billion.

Comparative October Inventories & Sales

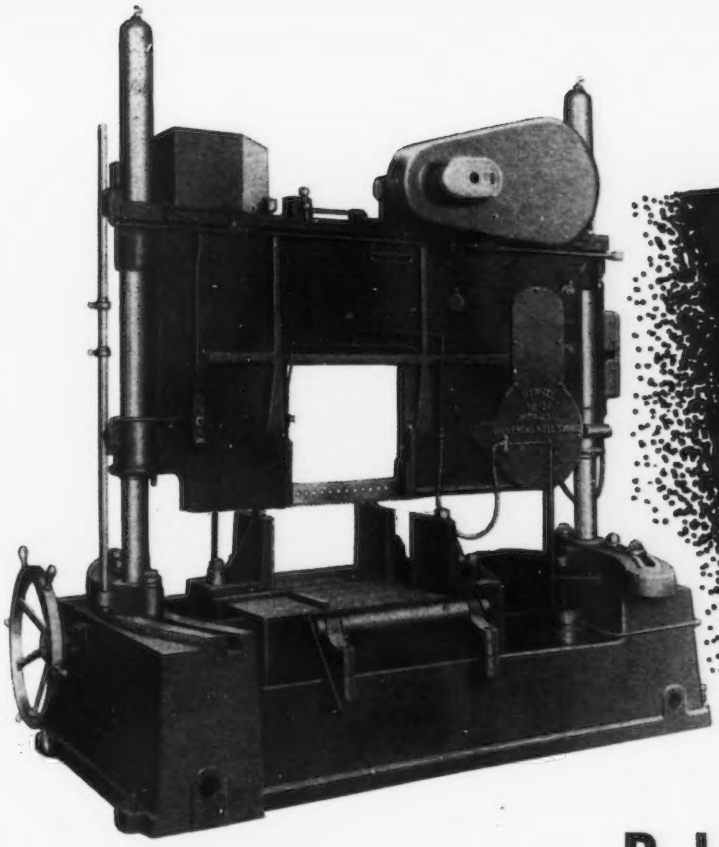
(Millions of Dollars)

	1939	1945	1946
Total Inventories	19,157	27,358	34,009
Manufacturing	10,069	16,457	19,553
Wholesale	3,599	4,113	5,338
Retail	5,489	6,788	9,118
Total Sales	14,839	26,829	34,698
Manufacturing	5,649	10,248	12,440
Wholesale	5,442	9,457	13,455
Retail	3,748	7,124	8,803

Taxpayers, Happy New Year!

Washington

• • • **Early in 1944, the House Special Committee on Postwar Economic Policy and Planning was granted an appropriation of $100,000 for the initial year's work. The committee is now folding up. It has been able to conduct many useful studies for nearly three years without asking for an additional appropriation, and over $15,000 from its original appropriation will be returned at the end of the years. The Committee Staff Director is Marion B. Folsom, treasurer of Eastman Kodak.**



IN STEP WITH THE TIMES

FOLLOW THE LEADERS USE "GUSHER" COOLANT PUMPS

MODEL 9040

Photo courtesy
Armstrong Blum Mfg. Co.
Chicago, Illinois

RUTHMAN GUSHER COOLANT PUMPS

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Write for Catalog 10B

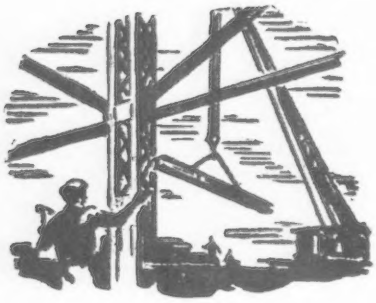
THE RUTHMAN MACHINERY CO.

1821 Reading Road Cincinnati, Ohio

European Letter

JACK R. HIGHT

• New eastern borders for Poland make Upper Silesian steel industry and coal fields once more an economic unit . . . Polish need for capital equipment makes effective iron curtain difficult to achieve.



LONDON — Integration of the Polish economy with that of Russia was mentioned in a press conference held here recently by Norman Neville, representative of the British Engineers' Assn. who has just returned from a technical conference in Katowice. According to his statistics, 71 pct of Poland's 1946 exports went to Russia, and 76 pct of its 1946 imports came from Russia.

Describing Polish plans to expand and modernize the Upper Silesian steel industry, Mr. Neville suggested that in his opinion the reconstruction of this area was the only possible alternative to rebuilding the Ruhr. In the 3-yr plan which the Polish Government would like to bring about for reconstruction, the steel industry would go up from 1,440,000 metric tons in 1938 to 2 million in 1949, which is the target year for the program. This production includes those Silesian industries which belonged to Germany between the wars but is now Polish. The program for pig iron expansion calls for 1949 production of 1,300,000 tons compared with 880,000 tons in 1938. Rolled product output is to advance from the 1938 figure of 1,100,000 metric tons prewar to 1,500,000. How such an expansion program, or any doubling or trebling or even quadrupling of this scheduled expansion is to replace the Ruhr output of 15 million to 20 million tons was not explained by Mr. Neville.

The development and expansion of the steel industry in the new Poland will be seriously hampered by the lack of capital equipment of all kinds. Due to the ravages of the war, Poland has neither the machinery required to rebuild its industry, nor the money to buy it. The only hope for the success of the 3-yr plan is through generous foreign credits. According to Mr. Neville, Britain is not in a position to be able to grant such credits at the present time. The obvious alternative, as far as granting any substantial sums are concerned, is the United States.

There is a limited possibility that Poland may be able to procure parts of its requirements of capital equipment through barter systems, but these arrangements are difficult to consummate. Poland's list of commodities to export are limited, and are in some degree already tied to Russia. Food products should be Poland's biggest export, as its agriculture is by the far the biggest industry. The war left Poland short of seed, and horses, as well as missing 8 million of a prewar 22 million agricultural workers.

THE established prewar system of tiny self-sufficient farms is considered by the present government to have been the curse of the nation, and it is hoped that widespread, long range mechanization of the farms will make it possible to free thousands of the farmers remaining for industrial work. Mr. Neville pointed out that in any consideration of the future of these people their prewar condition must be considered. In those days 10 million lived in such dire poverty that they had no material goods other than those things which they produced on their own plots, while most of the others had less than $10 per year to spend.

Despite the fact that the farms were hard hit by the war, and today's meager diet is being substantially supported with UNRRA supplies, Poland is said to be prepared to offer some scarce foodstuffs for export in exchange for capital equipment needed for the 3-yr plan. Before the war, substantial amounts of cereals, sugar and fats were being exported, but in 1946 Poland was forced to import all of these products.

The importation of tractors and farm implements, and the construction of a Polish implement factory are both essential parts of the plan, but Poland is unable to pay for either.

Coal is the next greatest asset of the new Poland (new boundry lines cost the country two thirds of its oil production) as the new western border gave Poland the balance of the Silesian coal fields, as well as the steel industry. The coal mines are suffering the same ills as are most of those in Europe. There was an almost complete dislocation of labor (50 pct of Poland's population figured in compulsory mass migrations during the war) and there is an unwillingness on the part of those who are available to go to work in the mines.

GENERALLY speaking there was comparatively little mechanization in the mines, and the equipment which did exist was worked to death with a mininum of repairs during the war. The plan calls for considerable mechanization in the mines, but there is a need for power stations and other ancillary equipment, as well as coal cutting and loading equipment. About the only sources for this equipment which are in production at the moment are the United States and Britain.

Despite the difficulties involved, Poland exported substantial tonnages of coal during the latter months of 1946. As has been previously announced, most of this coal was promised to Russia as a part of a reparations settlement. Shipments have already been made to France, Switzerland, Sweden, Belgium and Holland, and all of the countries are hoping to increase their imports of Polish coal during 1947. Their anxiety is increasing as it becomes more and

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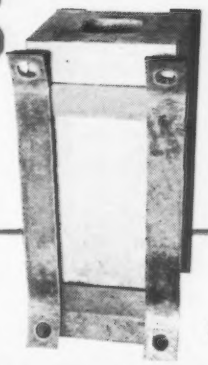

The graphite mold in which 538 ingots were cast

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more evident that exports from the Ruhr will probably be greatly reduced in 1947.

The national manpower shortage has its roots in the reduction of Polish population during the war from 35 million to 24 million. The loss of 11 million people was headed by the extermination of four million Jews, and their loss has left a tremendous gap in the Polish economy. The distributive trades have broken down almost completely with the loss, and large numbers of highly skilled laborers, engineers and professional people were in their numbers. The staffs of engineers and technicians left to help the nation in working out its salvation are said to be pitifully small.

MOST notable of the progress which has been made to date in the reconstruction of the country, according to Mr. Neville, is the rebuilding of the main line railways. The end of the war found 40 pct of the railway mileage unusable, 75 pct of the bridges out, 95 pct of the locomotives missing or damaged, and 90 pct of the passenger cars unusable. Essential services are now under way, although the representative of the British Engineers' Assn. stated that due to conditions approaching civil war in some sections of southern Poland the slow passenger trains are not exactly safe.

Big progress on the overall transportation rebuilding has also been made by the replacement of the nation's trucks by UNRRA. The prewar units were 100 pct useless or absent when the war ended, but their number has been exceeded by the shipment of trucks most of which were originally U. S. Army vehicles.

The transport picture is still extremely difficult because of dire shortage of freight cars, and those countries which are so fortunate as to be obtaining coal from Poland are doing so by moving the required number of cars to ship the coal. Of interest to coal starved Britons, Poland would probably be willing to offer coal for capital goods, if Britain could furnish the ships for the movement.

From Mr. Neville's account Russia's position in maintaining a row of satellites along her frontiers is not altogether a happy one. Much as America and Britain are in the position of being forced to feed Germany, for political if not humanitarian reasons, in the last analysis Russia has to feed Poland. Much of the type of equipment which Poland needs is also needed in great quantities by Russia. Thus the economies of the two countries are not to any great extent complementary, except in the emergency situation which exists today. The Russians are somewhat embarrassed in their relations with Poland at the moment as they have been unable to deliver the material from the Russian zone of Germany which was promised in the way of reparations. If there is an explanation to the situation where Poland "owes" coal to Russia on reparations, it is probably to cover expected large shipments from Russo-Germany.

Scrap Chapter Elects

Buffalo

• • • **The western New York** chapter of the Institute of Scrap Iron & Steel elected the following officers at the annual meeting held here recently: Saul Frankel, Rochester Iron & Metal, Rochester, president; D. Sloan Hurwitz, Hurwitz Bros. Iron & Metal Co., Buffalo, vice-president; Leo Chapin, Chapin & Fagin, Inc., Buffalo, secretary - treasurer; Harry Markowitz, Syracuse, Philip Roth and Herman Schwartz, Rochester, and Jay Risman and Terrence Hamlin, Buffalo, directors.

SUMMARY OF UNITED KINGDOM STEEL STATISTICS

Source: British Iron & Steel Federation

All Figures Thousands of Net Tons	STEEL			PIG IRON	SCRAP	IRON ORE	
	Ingots and Castings	Finished Deliveries	Steel Stock (1)	Production (2)	Steelmaking Consumption	Imported Ore Consumption	Home Production
1944 Total	13599.0	11502.4	2431.5	7542.0	8252.6	2725.6	17332.2
1945 Total	13237.8	9992.3	1885.9	7959.4	8065.9	4494.7	15870.4
1945 October	1360.8	932.4	1356.8	818.1	818.1	595.2	1385.4
November	1106.1	803.7	1358.0	672.0	659.9	467.7	1115.5
December	992.3	735.6	1332.4	651.8	592.7	449.7	1036.6
1946 January	1025.0	971.0	1370.9	803.6	754.8	541.5	1373.6
February	1107.5	833.2	1341.5	654.5	657.2	445.5	1373.6
March	1145.5	898.6	1314.7	659.9	695.2	484.2	1148.6
April	1129.4	827.0	1265.1	666.1	682.7	499.0	1090.8
May	1466.0	1139.0	1283.6	846.7	890.9	644.5	1371.4
June	1074.3	859.2	1266.3	678.7	640.1	531.7	1010.2
July	1012.9	791.1	1299.8	658.5	616.0	534.9	986.9
August	1265.0	968.2	1342.7	813.6	755.4	665.8	1252.1
September	1068.4	930.4	1329.2	659.9	648.7*	530.4*	1027.2
October	1424.1	1170.9	1236.3	872.4	860.2	707.3	1289.1

[1] Held by producers and in British Iron & Steel Corp. stockyards at the beginning of the years and months shown.
[2] All qualities, including ferroalloys.
* Revised.

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THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO

PERSONALS

o o o

• **William G. Caples** has been appointed manager of industrial relations for the Inland Steel Co., Chicago. He joined Inland a year ago upon his return to civilian status following war service with the Army Air Forces Engineers. During the past year he has served as staff assistant in the company's industrial relations activities.

• **R. G. Willaman** has been promoted to vice-president and sales manager of Peterson Steels, Inc., New York. **Daniel B. Hassinger** has been promoted to secretary and New York district sales manager. **H. J. Lawson, Jr.** has been named manager of the order department, and **R. F. Fischer,** assistant secretary.

• **Arthur C. Wiebel** has been appointed vice-president in charge of operations and **A. B. Haswell,** vice-president in charge of engineering of the Tennessee Coal, Iron & R.R. Co., Birmingham. Mr. Wiebel succeeds **Thomas M. Chalmers,** who has retired, and Mr. Haswell advances from the position of assistant to vice-president in engineering and construction. Mr. Wiebel came to Birmingham recently from Pittsburgh, where he held operating responsibilities as assistant to the vice-president in engineering and operations of the U. S. Steel Corp. of Delaware.

• **J. Fred Johnson** has retired from active service with the Bethlehem Steel Co., Bethlehem, Pa. Mr. Johnson has been in charge of the sales of sheet steel and tinplate for many years in the New York district.

• **John A. Payne,** president of Consolidated Coppermines Corp., has been elected chairman of the board of the Titan Metal Mfg. Co. of Bellefonte, Pa. New directors elected to the board were **Chester D. Tripp** who is also a director of Consolidated Coppermines, and **E. Norman Hickman,** vice-president of the American Metal Co., Ltd.

• **James N. Crawford** and **William R. Teller** have been appointed vice-presidents of Bryant Heater Co., Cleveland. Both Mr. Crawford, formerly sales manager, and Mr. Teller, heretofore director of engineering and development, will continue work in their respective fields.

• **Herbert H. Smith** has been promoted to sales agent in the mine and industrial division, National Malleable & Steel Castings Co., Cleveland. Mr. Smith, who has been a field engineer for National Malleable since 1945, joined the company's engineering department in Cleveland in 1937. **Robert D. Sowers** has been appointed to the industrial sales division of the Sharon, Pa. plant. He joined the company in 1936.

• **Harry J. Longeway,** comptroller of Michigan Steel Tubes Products Co., Detroit, has also been named secretary-treasurer, and elected to the board of directors. **George L. Miller,** vice-president in charge of sales, has also been elected to the board of directors.

• **Paul H. Eckstein** has been appointed assistant general sales manager of Pressed Steel Car Co.'s domestic appliance division, Chicago. Prior to the war he was with Stewart Warner Corp. as sales promotion manager and also as district sales manager in the southeastern states.

• **P. W. Armstrong,** vice-president, has been assigned new duties and responsibilities in charge of shop operating methods and equipment and other duties at all three plants of Mississippi Valley Structural Steel Co., Decatur, Ill. **E. T. Blix** has been appointed manager and **J. C. Arntzen,** chief engineer of the Melrose Park plant. **R. E. Carr,** manager of the Decatur plant, has been elected vice-president.

• **Luke H. Sperry,** a member of the board of directors and director of engineering for Hercules Powder Co., Wilmington, Del., has retired. **Ernest S. Wilson,** chief engineer, has been appointed director of the engineering department, while **Ray N. Wheelock,** assistant chief engineer, becomes assistant director.

• **T. R. Dearden** has been appointed chief engineer of the Michigan Seamless Tube Co., South Lyon, Mich.

• **D. W. Drummond** and **Arthur T. Bennett** have been elected vice-presidents of the Mathieson Alkali Works, New York. Mr. Drummond's new title will be vice-president - general manager of sales. He joined the Mathieson organization in 1938 as assistant sales manager of the carbon dioxide division. At the time of his election to his new post he was general manager of sales. Mr. Bennett is now vice-president-general manager of operations. He joined Mathieson as a technical assistant in 1933. In 1943 he became general manager of operations.

• **W. C. Winkel,** former executive vice-president of the Modine Mfg. Co., Racine, Wis., has been elected president to succeed **A. B. Modine,** who becomes chairman of the board of directors.

• **J. D. Seiler** has been appointed assistant works manager of the American Car & Foundry Co.'s Milton, Pa. plant, which specializes in the building of ACF tank cars, tank car tanks, storage and pressure vessels. Mr. Seiler has been with the company for a period of 40 yr.

• **George P. Hough** has been appointed executive administrator for the Chicago district of A. O. Smith Corp., Milwaukee. Mr. Hough succeeds **Don T. Allen** who has resigned.

• **C. E. Lewis,** former executive vice-president of the Perfex Corp., Milwaukee, has been elected president to succeed **Julius K. Luthe,** founder and president since 1934, who was made chairman of the board of directors.

• **George D. Keller,** formerly associated with the Studebaker Corp., has been named president of the Bobbi Motor Car Corp., Birmingham.

• **Howard F. Hazel,** formerly mills superintendent of Oregon Steel Mills, Portland, has been appointed general superintendent in charge of all their plant operations.

• **S. E. Voran** has been named advertising manager, Parker Appliance Co., Cleveland. Prior to joining Parker, he had served as account executive for Fuller & Smith & Ross, Inc.

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OPERATING records prove that you can rely on Fairbanks-Morse Diesels for dependable power, month in and month out . . . prove, too, that their operating and maintenance costs are low.

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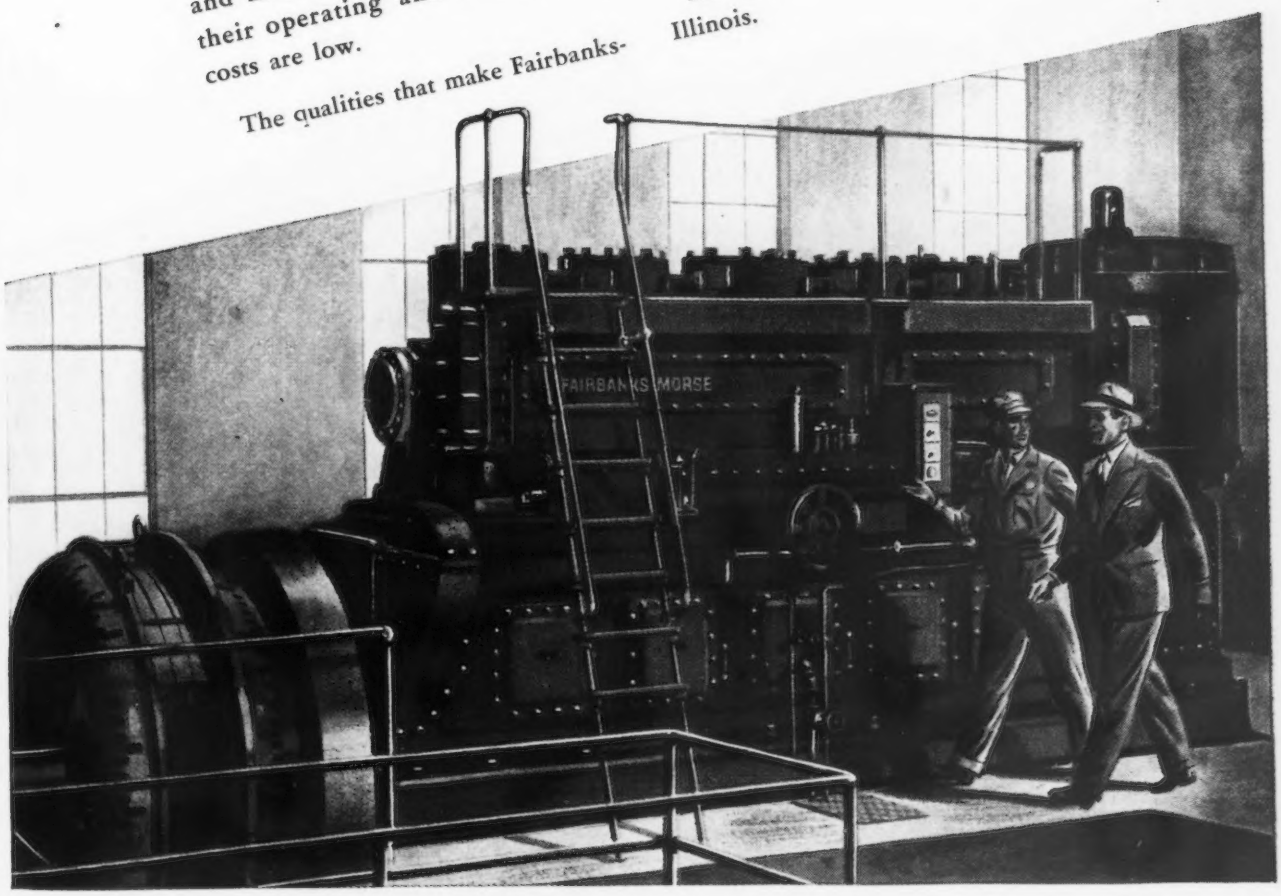

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Dear Editor:

"NEWHOFT"?

Sir:

We are passing on to you a question which has been proposed to us by a company who exports steel wire and rods and who has received a telegram from a prospective customer in China which reads in part: "Quote us on mild steel wire rods Newhoft gage No. 5." What is meant by "Newhoft" gage? We have checked out here without success. We are wondering if the cablegram was garbled and that the word "Newhoft" should be broken down into "new" "ho" and "ft," so that it would not pertain to any type of scale such as Birmingham or Brown & Sharpe gage, but rather was meant to say something like "new hot feet." At any rate can you identify "Newhoft" gage and if so, how it can be converted to one of the better known gages in this country. It is possible the spelling is incorrect and that it may be of German origin since we understand the Chinese bought such products from Germany prewar.

R. T. REINHARDT
Regional Editor

THE IRON AGE
1355 Market St.
San Francisco

● That is this week's $64 question! We have gone through a half dozen engineering handbooks and have checked with other sources of information including the American Standards Assn. and the American Iron & Steel Institute and no one has ever heard of "Newhoft" gage. One suggestion, however, was that it may have been derived from "Alhoff-Muller" but how it can be converted into one of the better known gages is not known with the little information at hand. Perhaps one of our readers can enlighten us.—Ed.

METAL OXIDES

Sir:

Will you kindly send us a tear sheet of the article, "Dissociation Pressures of Metal Oxides," which appeared on p. 61 of the Sept. 26 issue?

E. J. GILMORE

Engineering Dept.
Cleveland Graphite Bronze Co.
Cleveland

TIN RESEARCH COUNCIL

Sir:

I would appreciate if you could give me the present address of the International Tin Research and Development Council. I have written to them at the address given in their "Second General Report of 1937," but the letter was returned.

CARL NAGEL
Mechanical Engineer

948 Stanyan St.
San Francisco

● Technical representative of the Tin Research Institute here in the U. S. is Battelle Memorial Institute, Columbus, Ohio. Headquarters of the International Tin Research and Development Council, Tin Research Institute, are at Fraser Rd., Greenford, Middlesex, England, and the statistical office of the Council is located at 19, Lyceumplein, The Hague, Holland.—Ed.

PHILIPPINE STEEL PLANT

Sir:

With reference to your Nov. 28 issue and the article on p. 120 entitled "Steel Plant Proposed for Philippine Islands," I am interested in this proposed steel mill and wonder if you could advise me whom I could contact for further information.

VICTOR STEVINS

1418 No. Ft. Thomas Ave.
Ft. Thomas, Ky.

● As to the project itself, it is understood to be dormant at present, pending future developments as to capital and business conditions. Inquiries concerning it should be addressed to The Honorable Secretary of Foreign Affairs, The Philippine Commonwealth, Manila, P. I.—Ed.

COST REDUCING PROGRAM

Sir:

Please send two reprints of article in the Sept. 26 issue, "Cost Reducing Program for a Job Shop," by P. C. Hamlin.

M. S. CARSON
General Superintendent

Link-Belt Ltd.
Toronto 8

● We did not reprint the article requested. However, we are mailing tear sheets.—Ed.

ALUMINUM TUYERES

Sir:

We would appreciate receiving tear sheets of the article, "Aluminum Blast Furnace Tuyeres," by R. Guillemot, appearing in the Oct. 10 issue, p. 68 to 70.

H. D. KENNEDY

Frontier Bronze Corp.
Niagara Falls, N. Y.

SILVER MANGANESE ALLOY

Sir:

On p. 80 of the Sept. 26 issue you report the development of a German high-temperature solder. The solder referred to is an alloy of silver with manganese, not magnesium as stated.

R. H. LAMBERT
Commander, U.S.N.

Navy Dept.
Bureau of Ships
Washington

● Thanks Comdr. Lambert for pointing out that error. The original OTS description of the alloy did specify a silver magnesium alloy, but we should have spotted the mistake. Thanks again.—Ed.

PIPE BENDING

Sir:

We would appreciate knowing the name of some reliable manufacturer of pipe bending machines for bending pipe 3 to 4 in. in diam. Also we would like information regarding pipe bending.

A. UTZINGER

Agawam Tool Co.
Springfield, Mass.

● Names of some of the larger companies manufacturing pipe bending machines are being forwarded.—Ed.

TOOL STEELS

Sir:

Will you please send us your latest edition of the "Directory of Tool Steels?"

W. L. WARRANDER
Secretary-Treasurer

Tools & Gages, Inc.
Cleveland

● The new and revised edition of the "Directory of Tool Steel", a copy of which is being sent to you, is available to readers at the following prices: $1 for a single copy, $1.50 for two copies, $2 for three copies, and 50¢ each for five or more copies.—Ed.

INQUIRY FROM SOUTH AFRICA

Sir:

Can you please supply us with the names of firms who make machinery for manufacturing ring flanges out of bar stock, suitable for pipes from 8 to 18 in. in diam?

B. G. TWYCROSS
General Manager

Hume Pipe Co. (South Africa) Ltd.
Germiston, Transvaal

● Names of several companies manufacturing pipe flanging machinery are being forwarded.—Ed.

POWER HACKSAW ILLS

Sir:

We would appreciate if you would forward us four copies of the article, "Power Hacksaw Ills—Their Causes and Cures," by William Shortell, appearing in the Oct. 24 issue.

R. H. GRACE
Technical Dept.

Remington Arms Co., Inc.
Ilion, N. Y.

SPARK TESTING

Sir:

Would you please advise me if I can obtain a copy of the article entitled "Classifying Steels by Spark Testing," as published in the Oct. 19, 1939 issue.

M. R. WARREN
District Purchasing Agent

Aluminum Co. of Canada, Ltd.
Kingston, Ontario

● Unfortunately our supply of the Oct. 19, 1939 issue is exhausted, but perhaps you could obtain a copy from H. W. Wilson Co., 960 University Ave., New York 52, a back number magazine dealer.—Ed.

CENTRIFUGAL CASTING

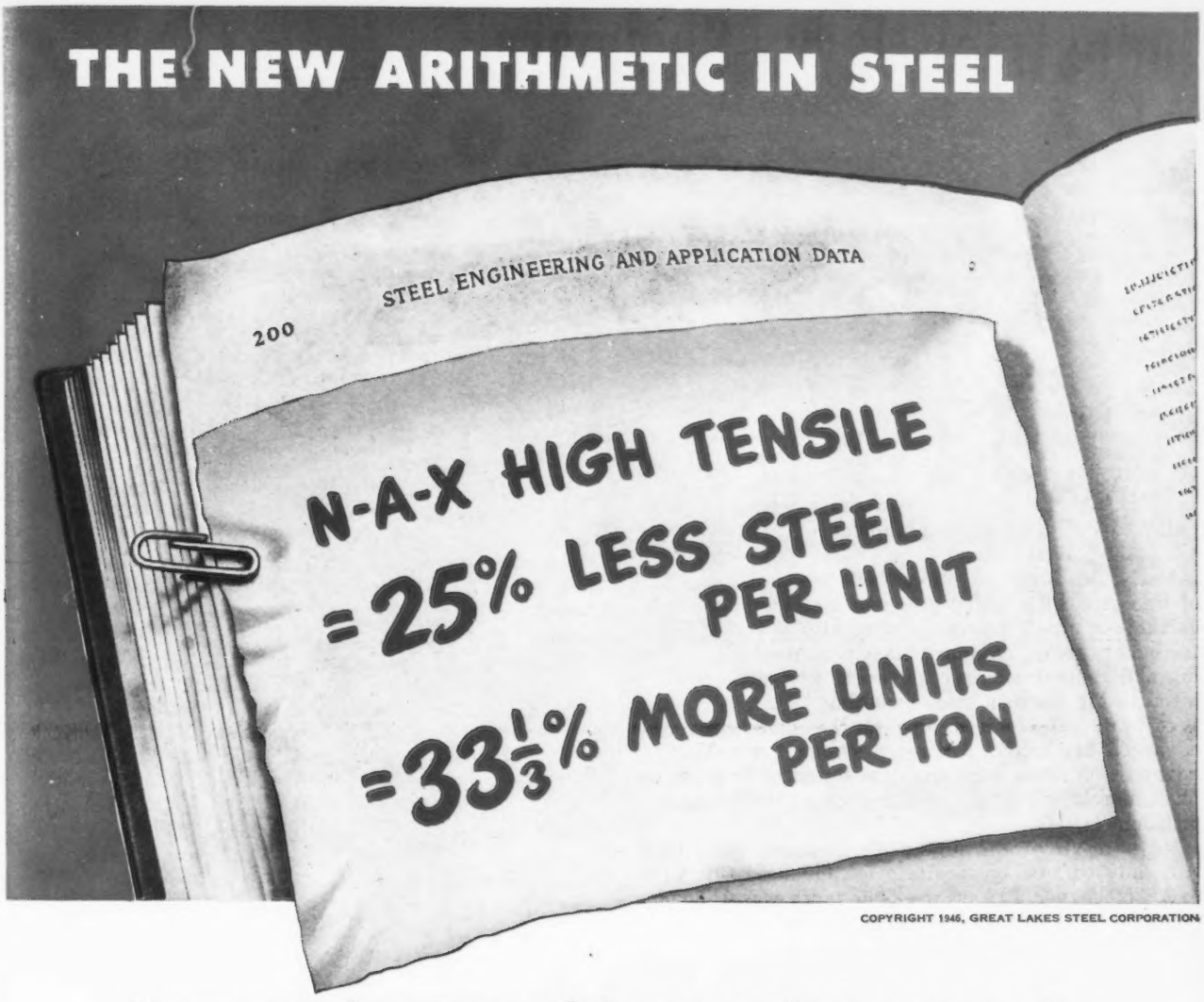
Sir:

Please send a reprint, if available, of the article, "Centrifugal Casting in Germany," which appeared in the July 25 issue.

MYRON K. BOATMAN
Methods Dept.

Johnson Bronze Co.
New Castle, Pa.

THE NEW ARITHMETIC IN STEEL



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Because of its greater strength, toughness, fatigue- and corrosion-resistance, this low-alloy, high-tensile steel ordinarily permits reduction in sectional thickness of as much as 25%. This means 33⅓% more units per ton of steel—with actual improvement in the strength and durability of finished products. And because N-A-X HIGH-TENSILE steel has exceptional ductility for high-strength steel, it can be deep-drawn and formed into intricate shapes.

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Tomorrow, N-A-X HIGH-TENSILE will be available in ever greater quantities and to a wider field of users. Even though current production can't always keep pace with demand, our engineers will be glad to show you how helpfully N-A-X HIGH-TENSILE steel can fit into your future production picture.

MAKE A TON OF SHEET STEEL GO FARTHER
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HIGH-TENSILE STEEL

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N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

Industrial News Summary...

- ***Further Steel Price Increases Made***
- ***Consumer Buying Habits to Change***
- ***Wage Negotiations to Take Spotlight***

AS 1946 came to a close steel consumers were digesting higher steel prices in the form of base price adjustments and changes in extras, steel producers were fearful that wage negotiations to begin in the middle of this month might mean much higher steel costs and further increases in prices, and the steel trade in general was privately worrying about the effect of price increases already made as well as the substantial tonnage of unbalanced inventories in the hands of consumers.

Early this week advances were made in the price of line pipe, oil country pipe and merchant black and galvanized pipe. Increases were also put into effect for boiler tubing. Standard black pipe, used for plumbing and general construction work, was advanced $10 a ton in the common sizes including ½ in., ¾ in. and 1 to 3 in. Galvanized pipe in the same sizes was advanced $14 a ton. On extra strong buttweld pipe, advances on these same sizes amounted to $8 a ton on black merchant grades and $12 a ton on the galvanized product.

As a result of the pipe price increases THE IRON AGE finished steel composite price advanced this week to 2.835995¢ per lb. Last week the index was 2.756545¢ a lb. A month ago it stood at 2.70711¢ a lb. Taking into consideration base price increases made over the past month the composite price of finished steel has advanced about $2.60 a ton, but because the composite does not include extra charges which have been substantially revised in the past several weeks, the net price of steel to consumers has advanced more than the composite price change would indicate.

AMONG some steel consumers this week there was a tendency to take a detailed look at requirements before actual orders were placed. Part of this tendency was due to the complicated changes reflected in revised extra charges as well as the higher prices which were being paid for steel. Some manufacturers were already looking for lower priced steel products to replace those on which quotations had been advanced while some warehouses were expected to drastically reduce the amount of stocks of certain steel grades which were carried a few months ago.

Most manufacturing concerns were giving close scrutiny this week to the substantial unbalance in their inventories. Some concerns were concentrating on bringing up the volume of the least available steel product and canceling or failing to order additional tonnages of those products which in relationship to others appeared plentiful. Still other manufacturers, who found it necessary to borrow money in order to maintain their inventories until such time as a heavier production schedule could be obtained, were busy reducing overhead costs in conformance with the request of the institutions carrying or supplying the loan.

With the CIO apparently standing strongly behind the Nathan report which claims that wage advances can be given without price increases and with industry generally claiming that the Nathan report is not statistically correct, it is apparent that the steel wage negotiations will soon take the national spotlight and provide a final determination for 1947 labor trends.

IN VIEW of the price revisions which the steel industry has made on products which it has consistently claimed have been made at a loss or at least at a low return, there is a possibility—and it may be remote—that one of the larger steel units may make a moderate wage increase offer to start the negotiations off on a "good plane." The probability of further decreases in the cost of food and other items which loom large in the cost of living may cause the union to refrain from assuming a "take it or leave it" attitude.

Even though a strike vote results in a majority favoring such action Mr. Murray, head of the steel union, as he has done in the past, could and might make a postponement in any decisive strike action, especially if the initial wage negotiations indicate a favorable trend for the union. An unfavorable trend from the union's standpoint would however find the steel union willing to call a strike for bargaining purposes.

Higher scrap prices in recent weeks continued to make inroads into some of the gains which steel companies were making because of more balanced steel prices. This week, however, the scrap market appeared to be stable, at least temporarily. THE IRON AGE composite this week was unchanged from last week's revised price of $31.17 a gross ton. Before a correction was made in last week's composite price, it had been $31.83 a gross ton.

THE steel ingot rate this week is 86.5 pct of rated capacity, up 10½ points from last week's revised rate of 76.0 pct. Some units are not entirely back to their pre-coal strike level.

Delivery pressure in the industry this week remains strong, despite the fact that some customers have shown a more cautious attitude in placing orders. No immediate change in extended delivery promises is expected until the industry gets over the hump of wage negotiations. If the latter do not result in a strike, sustained output for 3 or 4 months at around 90 pct of capacity will make an important and substantial dent in unfilled tonnage now carried upon the books of most steel firms.

Because the portal-to-portal pay issue involves fantastic back pay figures, it appears obvious that definite Congressional action will be taken at least on the retroactive feature of the problem. The lack of such action and success for the various unions in their suits involving billions of dollars would wreck so many companies financially that it seems inconceivable that such a conclusion could be allowed to result.

• **POPULAR SURPLUS SALE**—Sales of surplus property by WAA at the former Dodge-Chrysler Chicago plant attracted 2200 buyers purchasing $3,350,000 worth of material in the first 7 days of the sale. Customers from both coasts, as well as foreign buyers, are still purchasing surplus materials at a record rate. The most popular items included gear hobbers, radial drill presses, turret lathes, polishing jacks and internal grinders. General Motors, International Harvester, Caterpillar Tractor, Fruehauf Trailer and Massey-Harris, were represented by purchasing agents, with the largest sale going to GM. The latter bought machinery totaling close to $100,000. Some of this material, it is understood, will be shipped to the firm's Australian plant in Sidney, for use there.

• **PASSENGER CAR PREDICTION**—New passenger car registrations for the year 1946 totaling more than 1,300,000 units have been predicted by R. L. Polk & Co., statisticians for the automotive industry. New passenger car registrations for October from 44 states indicate that the sale of new cars will surpass 225,000 units for the month. Registrations are currently running more than 50,000 higher than prewar totals for comparable months. New truck registrations are continuing at a record pace. Registrations from 41 states for October numbered 53,580 units as compared with 30,343 for October 1941. The final quarter of the year should see record registrations of both new passenger cars and new trucks, Polk officials said.

• **FABRICATED STEEL ACTIVITY**—More than 640,000 tons of carbon and alloy steel were consumed during the first half of 1946, by 260 plants representing about 75 pct of the fabricated structural metal products industry, according to the Bureau of the Census. Products valued at more than $35 million were shipped during June, it was reported. Meanwhile, the Bureau also reported that despite an increase of a quarter-million units of heavy steel barrels and drums during the month of October, the backlog of orders increased 7 pct to bring the total to 13.1 million. In addition, unfilled orders for light barrels and drums totaled 2.1 million while orders for steel packages, kegs and pails (from 1 to 12 gal) amounted to nearly 34 million units. Production capacity of the steel container industry, in terms of steel consumption, is rated at better than 1.2 million tons annually. The industry used about 850,000 tons in 1945 for the production of 22.2 million heavies, 9.9 million lights, and 62 million packages, kegs and pails.

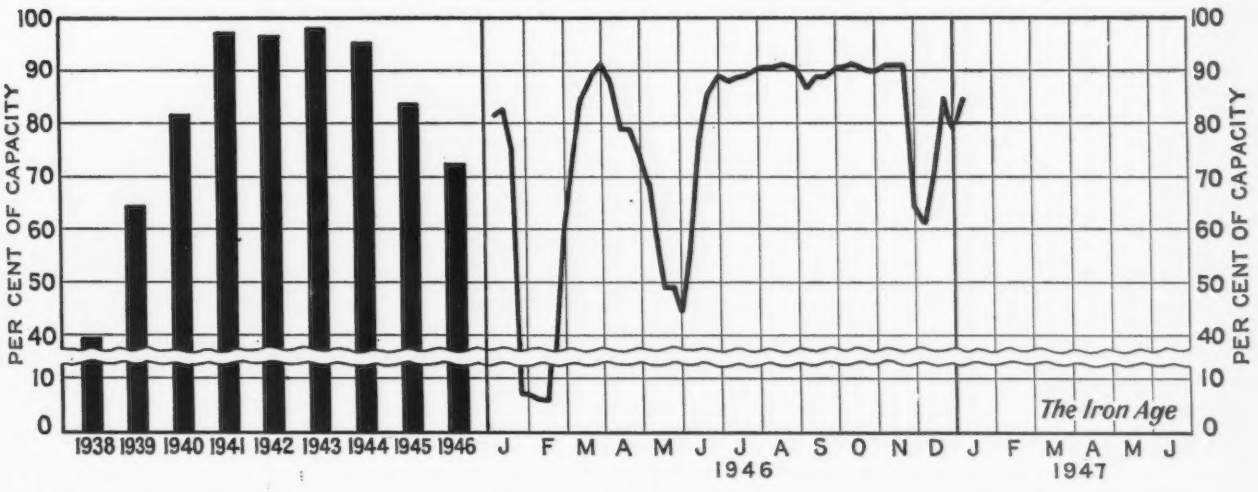
• **LIFESAVER DISCARDED**—The large export freight car orders taken on by the car builders prior to the flood of domestic car orders have now been stopped by CPA. Through the acceptance of the foreign orders the car builders were able to maintain and train the needed personnel during the very quiet period after the end of the war when the domestic railroads did not come through with large orders. The foreign program can now be completed but no further orders can be accepted now by car builders. Pullman-Standard Car Mfg. Co., reports they have 80 pct of the material and parts needed to fulfill their obligations and they expect to complete their export orders by the end of the first quarter of 1947. Executives of Pullman say that the new CPA directive does not necessarily guarantee greater production of domestic freight cars as material shortages are the real bottleneck.

• **STEEL QUIT RATE**—Blast furnace, steel plant, and rolling mill workers show the lowest quit rate, 32 per thousand employees, in the iron and steel products industry, according to a survey by the Bureau of Labor Statistics. Reflecting the relatively high quit and accession rate characteristic of full employment periods, the BLS gave the October factory quit rate at 46 per thousand workers. For iron, steel, and their products as an industry, the rate was 42 per thousand. Automobile workers were relatively high with a rate of 51 while the figure for the entire machinery field was 36. In nonferrous metals and their products, the rate was 46.

• **CAR IMPORTS LOW**—During the first 9 months of 1946, 601 foreign manufactured passenger automobiles were imported into the United States, Dept. of Commerce statistics show. In addition to eight from Canada, the United Kingdom shipped 514, France 67, and Italy 12. Among the makes now imported are the British Austin, the French Citroen, and the Italian Fiat.

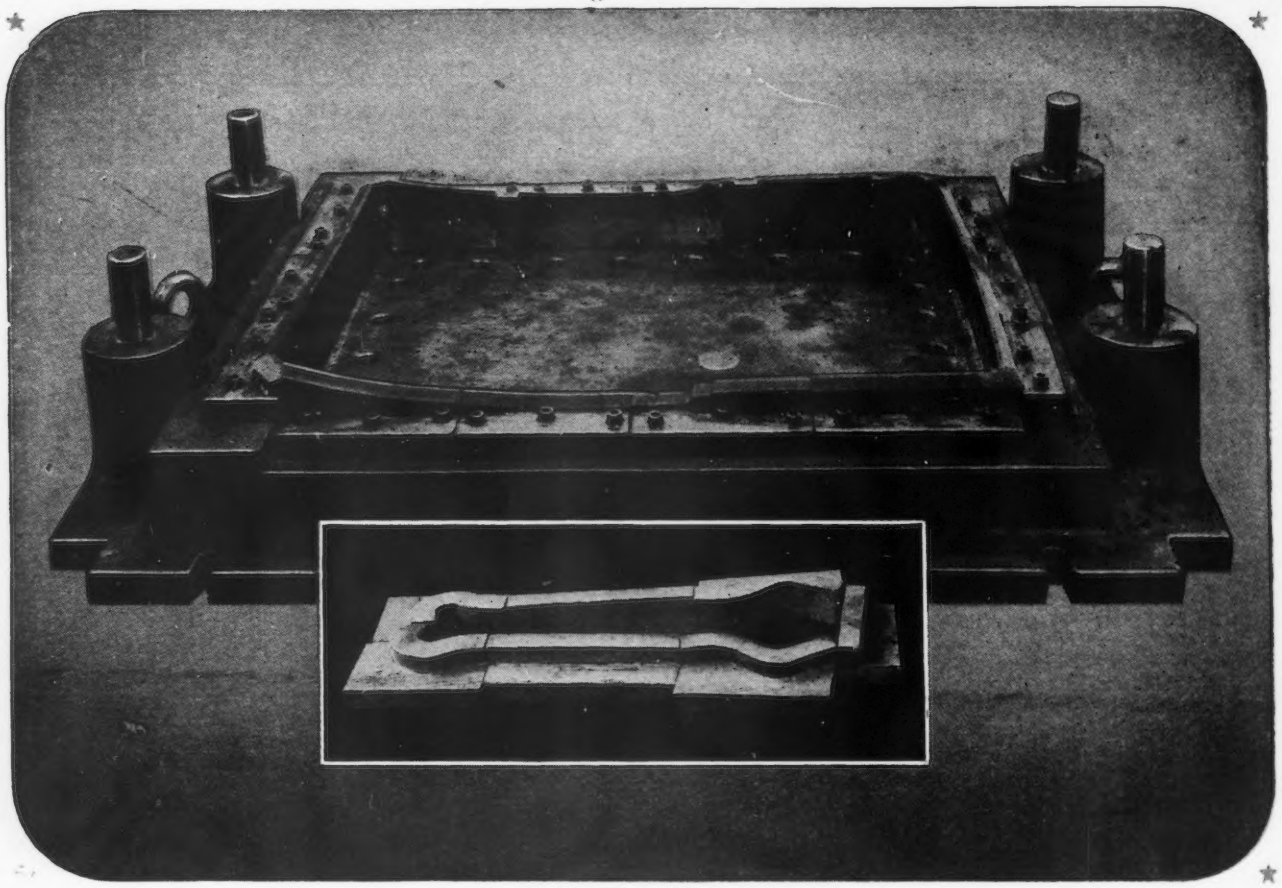
• **WAIVE SUBSIDY**—Some of the producers of merchant pig iron who are eligible to collect the subsidy price granted by CPA have decided to discontinue the practice. Although eligible to receive the premium payments the companies have decided that with the recent increase in price, subsidy payments are not necessary. The producers of iron will, however, continue to supply consumers with all the iron earmarked per the original agreement with CPA.

Steel Ingot Production by Districts and Per Cent of Capacity



Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
December 24...	82.0	74.0*	73.0	80.5	84.0*	99.0*	71.0*	95.0	94.5	68.0	83.5	70.0	76.5	76.0*
December 31...	96.0	88.5	84.0	85.5	94.0	99.0	84.0	99.0	102.5	72.0	92.0	80.0	85.0	86.5

* Revised.



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ALLEGHENY LUDLUM
STEEL CORPORATION
Forging and Casting Division
Detroit 20, Michigan

Crucible Steel Co. Readjusts Prices of Stainless Steel Products

New York

• • • **Price readjustments** on stainless steel products, including sheets, plates, hot and cold-rolled strip, bars, drawn wire, structural shapes and forging billets have been announced by the Crucible Steel Co. of America effective Jan. 1.

In general, the new base prices represent increases to the next higher 50¢ per 100 lb, although some products already priced at a round figure have not been changed. The company states that establishment of the new base prices and extras avoids the necessity for the calculations previously made necessary by the former 8.2 pct addition to base price and extras.

Apparently the company is ready to absorb the increased cost of nickel for a time as the price readjustment is applied on an equal basis to stainless steel grades containing nickel and those without nickel.

No other producer has yet made any price announcement on stainless steel, and some are awaiting the outcome of wage negotiations with the steelworkers when the contract expires in mid-February before taking any action. It is understood that most stainless producers are in agreement with the need for a simplification of their present means of pricing and for a larger dollar return on their products. Because of this it is more than likely that many producers may be expected to follow Crucible's lead in this matter within a short time.

The new base price schedule for stainless steel products established by Crucible Steel Co. of America is shown below.

Says Stamping Output Can Exceed All Records

New York

• • • **With the growing** importance of stampings in the design and production of consumer goods, output of stampings in 1947 will exceed any previous peacetime or even war years provided labor problems and labor shortages improve, it was stated by Clarence W. Custer, president of the Pressed Metal Institute.

Fully aware of the primary role stampings play in the mass production of a great variety of products, the Pressed Metal Institute is making every effort to supply demand despite handicaps of strikes, slow delivery on new press equipment, severe shortages of steel sheets and other raw materials. These and other difficulties including OPA regulations seriously curtailed production during the first two quarters of 1946, and at the close of the year the majority of pressed metal manufacturers reported that they were having difficulty meeting customer requirements.

In Mr. Custer's opinion, new mechanical and hydraulic presses, new developments in welding and brazing, improved handling of stampings, new methods and techniques developed during the war years place the industry in an excellent position to make a vital contribution to production in the year ahead.

Stainless Steel Base Prices—Crucible Steel Co. of America

Grade	Carbon	Chromium	Nickel	Other Elements	Bars Drawn Wire Structurals	Plates	Sheets	Hot Rolled Strip	Cold Rolled Strip	Forging Billets
301	0.08-0.20	16.00-18.00	6.00- 8.00	Mn 2.00 max	26	29½	37	22	28	22½
302	0.08-0.20	17.00-19.00	8.00-10.00	Mn 2.00 max	26	29½	37	23½	30½	22½
302B	0.08-0.20	17.00-19.00	8.00-10.00	Si 2.00-3.00, Mn 2.00 max	26	29½	37	23½	30½	22½
303	0.20 max	17.00-19.00	8.00-10.00	P or S or Se 0.07 min or Mo 60 max, Mn 2.00 max	28½	31½	39	29½	36	24
304	0.08 max	18.00-20.00	8.00-10.00	Mn 2.00 max	27½	31½	39	25½	32½	23
308	0.08 max	19.00-21.00	10.00-12.00	Mn 2.00 max	31½	37	44½	31	38	27
309	0.20 max	22.00-24.00	12.00-15.00	Mn 2.00 max	39	43½	51	40½	51	33½
310	0.25 max	24.00-26.00	19.00-22.00	Mn 2.00 max	53½	56½	57½	53	61	45½
311	0.25 max	19.00-21.00	24.00-26.00		53½	56½	57½	53	61	45½
316	0.10 max	16.00-18.00	10.00-14.00	Mo 1.75-2.50, Mn 2.00 max	43½	48	52	43½	52	37
321	0.10 max	17.00-19.00	8.00-11.00	Ti min 4 x C, Mn 2.00 max	31½	37	44½	32	41½	27
325	0.25 max	7.00-10.00	19.00-23.00	Cu 1.00-1.50	28½	32½	40½	28½	37	24
330	0.25 max	14.00-16.00	33.00-36.00		53½	56½	57½	53	61	45½
347	0.10 max	17.00-19.00	9.00-12.00	Cb 8 x Carbon min, Mn 2.00 max	36	41½	49	36	45½	30½
403	0.15 max	11.50-13.00	....	Turbine quality	23½	27	32	23	29½	20
405	0.08 max	11.50-13.50	....	Al 0.10-0.30	22	25	30½	21½	28	18½
406	0.15 max	12.00-14.00	....	Al 3.50-4.50	25	28½	34	25	34	21½
410	0.15 max	11.50-13.50	....		20½	23½	29	18½	24	17½
414	0.15 max	11.50-13.50	1.25- 2.50		20½	23½	29	18½	24	17½
416	0.15 max	12.00-14.00	....	P or S or Se 0.07 min, or Mo 0.60 max	21	24	29½	20	25½	17½
420	over 0.15	12.00-14.00	....		26	31	36½	26	39½	22½
430	0.12 max	14.00-18.00	....		21	24	31½	19	24½	17½
430F	0.12 max	14.00-18.00	....	P or S or Se 0.07 min, or Mo 0.60 max	21½	24½	32	20½	27	18
431	0.20 max	15.00-17.00	1.25- 2.50		21	24	31½	19	24½	17½
440A	0.60-0.75	16.00-18.00	....		26	31	36½	26	39½	22½
440B	0.75-0.95	16.00-18.00	....		26	31	36½	26	39½	22½
440C	0.95-1.20	16.00-18.00	....		26	31	36½	26	39½	22½
442	0.35 max	18.00-23.00	....		24½	28	35½	26	35	21
443	0.20 max	18.00-23.00	....	Cu 0.90-1.25	24½	28	35½	26	35	21
446	0.35 max	23.00-27.00	....		30	33	39½	38	56½	25½
501	over 0.10	4.00- 6.00	....		9	13	17½	13	18½	....
502	0.10 max	4.00- 6.00	....		10	14½	18½	14½	19½	....

Note:—No specific composition limits within the above range should be placed on Types 301, 302, 302B and 303 except that carbon may be specified to a four point range within the above limits.
When carbon content .11 or under is specified or required in Types 301, 302 and 302B the price of type 304 applies.

A. O. Smith Russian Pipe Suit Settlement Follows Stipulation

Milwaukee

• • • **Litigation which was** started over 2 months ago concerning the pipeline order taken by A. O. Smith Corp. from the U. S. Treasury for delivery to Russia, resulted in the Russian government being denied the right to take over the contract from the Treasury Dept. The decision, rendered in the United States district court of Western Texas, Judge C. A. Boynton presiding, came as the result of a stipulation presented to the court by A. O. Smith and five other large domestic companies whose interests were involved. The stipulation set forth a plan for the allotment of Smith's production of pipe which was satisfactory to all the companies. In addition, A. O. Smith asked that the court rule on whether Russia had a legal right to step in. The court ruled that Russia had no rights in the matter.

The stipulation further provided that any purchaser could secure pipe from A. O. Smith outside the agreed allotment, if the purchaser could provide the steel, and if A. O. Smith's pipe mill were not operating at capacity. The possibility of available pipe mill capacity arises out of current uncertainties in supplies of steel.

Governer Warren of California, in a telegram to the State Dept., charged that A. O. Smith had given preferential position to the Russian order. He asserted that the filling of the order would delay construction by the El Paso Natural Gas Co. of a pipe line of nearly 1000 miles from Texas to Southern California. A. O. Smith promptly answered that it had no order from the Russian government but that it did have an order from the U. S. Treasury Dept. for 183 miles of pipe. Smith also pointed out that the Treasury order had been placed before the El Paso order and that it had no choice but to fill it first.

The order placed by the Treasury Dept. for United Nations Relief was handled by UNRRA and it was planned to deliver the pipe to the Ukraine District of the USSR. After Governor Warren's message, the U. S. Treasury cancelled the order but the El Paso company nevertheless went to the state court of Texas to demand an injunction which would prevent A. O. Smith from accepting any order from Russia, or anyone else, until its own order for 764 miles of pipe was completed.

The case subsequently was transferred to the Federal court and a petition was filed by five companies which either had orders with A. O. Smith or would be affected by the delivery of pipe to other companies if El Paso's claim to priority over them, as well as over Russia, should win court sanction. The companies were the Pan Handle Eastern Pipeline Co., of Kansas City and Chicago, the National Gas Pipeline Co. of America, Chicago, the Texoma Natural Gas Co., of Amarillo, Tex., and the Chicago District Pipeline Co. and the Texas Co. of New York. Under the stipulation, the El Paso company is to get 341 miles of its original Smith order, and by procuring its own steel, it hopes to complete its Texas-California line by taking advantage of the available capacity of the A. O. Smith mill.

National Tube Raises Pipe, Tubing Prices

Pittsburgh

• • • **National Tube Co.** announced, effective Dec. 28, that it was making certain upward adjustments in the prices of tubular products. Price changes vary from item to item partially to correct certain inequities which have become pronounced. Average increases on various lines are: Oil country tubular goods, up $6.50 a ton; seamless standard and line pipe, up $7.30 a ton; and butt-welded pipe, up $9.00 a ton. An increase has also been made in pressure and mechanical tubing but no announcement as to what it averaged was made.

WAA Offers Bearings

Washington

• • • **Switching from a fixed price** to a bid basis, WAA at its regional offices is offering for sale $24 million worth of war-surplus bearings of various sizes and types. The inventory includes about 30 million pieces covering a range of sizes suitable for use in small instruments or industrial equipment.

Blast Furnace Capacity and Production—Net Tons

	Number of Companies	Annual Blast Furnace Capacity	PRODUCTION							
			PIG IRON		FERROMANGANESE AND SPIEGEL		TOTAL			
									Pct of Capacity	
			November	Year to Date	November	Year to Date	November	Year to Date	November	Year to Date
DISTRIBUTION BY DISTRICTS:										
Eastern	12	12,988,970	798,881	7,575,098	25,786	215,946	824,667	7,791,044	77.2	65.5
Pittsburgh-Youngstown	16	25,939,940	1,730,793	15,963,163	16,914	156,774	1,747,707	16,119,937	81.9	67.9
Cleveland-Detroit	7	6,557,500	469,646	4,499,731	.....	.....	469,646	4,499,731	87.0	75.0
Chicago	7	14,093,510	947,324	8,817,596	.....	.....	947,324	8,817,596	81.7	68.4
Southern	9	4,924,670	309,995	2,919,283	7,386	102,625	317,381	3,021,908	78.3	67.0
Western	5	2,836,000	127,986	1,093,839	.....	.....	127,986	1,093,839	54.8	42.1
Total	37	67,340,590	4,384,625	40,868,710	50,086	475,345	4,434,711	41,344,055	80.0	67.1

Source: American Iron & Steel Institute

Strike-Plagued Mills Produced 65.8 Million Tons of Steel in 1946

New York

• • • **"Although major strikes** interfered with steel operations in 6 months of 1946, the nation's steel mills succeeded in producing about 65,800,000 net tons of steel during the year," Walter S. Tower, president of American Iron & Steel Institute, said recently. "That amount of ingots and steel for castings exceeded the output of any year prior to 1940, in which year war influences were strongly at work. If it had not been for the national steel strike and two coal miners' strikes, the industry doubtless would have produced more than 80 million tons of steel, and would have operated at close to 90 pct of its annual capacity."

Walter S. Tower

Mr. Tower continued, "If 1947 witnesses another series of major strikes, then shortages of steel will be prolonged despite the best efforts of the industry. But, if operations are strike-free, enough steel can be turned out to restore within a few months a balance between supply and demand for steel. Consuming industries have the benefit of an annual steel capacity of nearly 92 million tons, that is some 6,700,00 tons larger than in 1941, when many production peaks in the manufacture of consumer goods were established despite heavy shipments of steel for armament purposes.

"Members of the steel industry are expecting to spend millions of dollars in 1947 to expand and improve their finishing mill facilities," Mr. Tower declared. "In 1946, some $327 million was earmarked for this purpose by steel companies. An important part of this program will be the enlargement of the industry's facilities to turn out sheet and strip, two products widely used in the manufacture of consumer durable goods. In 1946, the industry's sheet and strip steel finishing capacity was 1 million tons larger than in 1941, and 2,500,000 tons in further additions were planned to come into operation in 1947.

"The 1946 production of steel ingots and castings at about 65,800,000 net tons," Mr. Tower said, "was almost 14 million tons below the 79,701,648 net tons produced in the preceding year. Steel mill operations in 1946 were at an average of 71.6 pct of capacity during the year, compared with 83.5 pct in 1945. However, 1946 operations rose and fell sharply as efforts to push steel production to top levels were hampered by repeated strikes, with the high for the year, 91.4 pct of capacity operations, established in the week of Nov. 18, and the low, 5.1 pct, established in the week of Jan. 21 during the steel strike."

"Steelworkers," Mr. Tower stated, "lost many millions of dollars in pay during 1946 as a result of the steel strike and the two coal miners' strikes. Thus, total industry payrolls came to approximately $1.5 billion for 1946, down 9 pct from the 1945 total of $1,645,332,700, although the average hourly rate paid to steelworkers in 1946 was at an all-time record high. The monthly rate in September for steel mill workers was at the average of 136.2¢ per hr.

"The pay increase granted in early 1946 to steel mill workers, 18.5¢ an hr, was only one of a number of boosts in operating costs during the year. In addition, prices of iron ore, coke, fuel oil, and equipment and machinery are higher, and railroad freight rates have been increased substantially since July 1, 1946. Railroad freight costs are a considerable factor in steel operations, due to the enormous amounts of raw materials that must be brought to the steel mills to permit operations. For example, in 1945, the steel industry had to bring in to steel plants more than 91 million tons of iron ore, 84 million tons of coal, 17 million tons of purchased scrap, and almost 6 million tons of fluxes."

"To offset increased costs facing the steel industry early in 1946," Mr. Tower said, "the Office of Price Administration granted it a price increase which was estimated by the OPA to average $5 a ton, and was regarded as inadequate by members of the industry, in view of the many items of increased cost since ceiling prices were established."

Declares High Rate Of Employment and Output Will Halt Depression

Washington

• • • **There is no national** economic ill which cannot be cured by the application of elbow grease and the cooperation of all concerned.

SENATOR FLANDERS

Such is the firm belief of Ralph E. Flanders, junior senator from Vermont, whose philosophy is the result of a wealth of experience gained as mechanic, inventor, business executive and governmental adviser.

It is accepted as a fact that the United States could be in for an indefinite period of prosperity provided that the current unprecedented high rates of peacetime employment and production continue. By careful planning, using the huge backlog of war-created and unfilled domestic needs, essential and otherwise, Mr. Flanders sees no need for another depression.

"High employment and production can be maintained," he told THE IRON AGE, "if everybody works together, Democrat and Republican, management and labor. But unless we do, our standard of living will suffer and our form of government and personal liberties will disappear."

Unemployment is one of the things the newly elected senator is interested particularly in guarding against. But he doesn't believe that there is any overall remedy, legislative or otherwise, which would prove of permanent benefit. He points out that a whole book of statutes cannot compel financiers to invest, employers to hire, or even workers to take jobs. There must be the right kind of incentives.

As to whether an annual wage plan is possible in the machine tool industry, with which he has been associated most closely in his lifetime, Senator Flanders believes that a satisfactory plan for this industrial field would be difficult to work out. The chief obstacle would be the fact that it is a "cyclical" industry.

December Machine Tool Orders Expand

Cleveland

• • • **Current reports from** some segments of the machine tool industry indicate that December turned out to be a considerably better month for the industry than almost anyone anticipated. Orders came in reasonably good volume, including quite a bit of foreign business, and the parts shortages that were hampering some segments of the industry loosened up considerably.

One qualified observer has already predicted that January will not be a bad month either, if foreign orders hold up, even though the industry has not seen the end of the surplus. Still remarkable, however, is the number of machine tools sold by the industry and by War Assets Administration during 1946 which the market was able to absorb.

Some criticism has been leveled at the policy group that controls WAA's machine tool scrapping program, because overage machines are falling into the hands of the speculators instead of being sold for scrap. It is alleged that the government's recovery from such sales is less than sale for scrap would bring. Aside from the fact that the scrap shortage, particularly in the cast grades, is acute, even overage machines in speculators' hands are not good for the market which will very likely be depressed to some extent by the good surplus machines which have been bought for stock.

With the holidays and the end of the year, there has been little activity in the industry during the last 10 days. Inquiries have been coming in, and some projects have come in for estimates for next year. On the other hand, WAA is becoming steadily more aggressive, particularly the top-side sales personnel in the machine tool units. Customers with checks in their hands are no longer beset with some of the difficulties that were the rule rather than the exception 4 or 5 months ago.

In the East business has been very quiet and government-owned machine tools are being revised downward pricewise in an effort to stimulate buyer interest without notable success. Many machine tool builders are making a real effort to get export business. Results are encouraging but not exciting quantitatively. Such new business coupled with better than prewar backlogs of domestic orders is virtual assurance to some observers that business will continue fairly strong after the first quarter of 1947 and elevate the industry to a comfortable position in respect to order books.

There is a problem, however, with rising prices on scrap, pig iron, freight rates and labor costs bearing on machine tool production costs which would seem to warrant higher prices for machines. On the other hand, the presence of the government-owned surplus still available in considerable quantity makes any price increase at this time a somewhat questionable course.

Copper and Zinc Prices Holding Firm

Copper

New York

• • • **Current copper** prices are holding firm in the face of rising world copper prices. The latest export copper price f.a.s. New York, without duty, is reported at 20¢ per lb. No copper is being imported at this time as consumer demand is being taken care of out of the government stockpile which is expected to last through February. At that time, if consumer demand is not reduced significantly by industry strikes or other economic conditions, an increase in price is indicated. However, it is possible that there may be some action to remit the 4¢ tariff in view of the need of consumers for foreign copper and the current application of pressure on government by consumers and most producers.

Zinc

New York

• • • **There is no** immediate prospect of a price increase in slab zinc although increasing world prices may be expected to exert pressure on domestic prices sooner or later. Zinc is reported to be imported from Canada in significant tonnages with domestic consumers paying the duty. One producer of zinc rolled products has announced price increases effective Jan. 1, of $7 a ton on sheet and $5 a ton on ribbon. Other producers are expected to follow suit but have not yet announced action. One producer of zinc oxide was contemplating an increase of lead-free oxide prices but has not yet announced its new price schedule.

Monthly Average Prices

• • • **The average prices of the major nonferrous metals in December, based on quotations appearing in** THE IRON AGE, **were as follows:**

	Cents Per Pound
Electrolytic copper, Conn. Valley	19.50
Lake copper, Conn. Valley	19.625
Straits tin, New York	70.00
Zinc, East St. Louis	10.50
Zinc, New York	10.94
Lead, St. Louis	12.027
Lead, New York	12.204

Nonferrous Metals Prices

Cents per pound

	Dec. 25	Dec. 26	Dec. 27	Dec. 28	Dec. 30	Dec. 31
Copper, electro, Conn.	19.50	19.50	19.50	19.50	19.50	19.50
Copper, Lake, Conn.	19.625	19.625	19.625	19.625	19.625	19.625
Tin, Straits, New York	70.00	70.00	70.00	....	70.00	70.00
Zinc, East St. Louis	10.50	10.50	10.50	10.50	10.50	10.50
Lead, St. Louis	12.35	12.35	12.35	12.35	12.35	12.35

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, f.o.b. shipping point (min. 10,000 lb)	15.00
Aluminum pig, f.o.b. shipping point	14.00
Antimony, American Laredo Tex.	28.25
Beryllium copper, 3.75-4.25% Be; dollars per lb contained Be	$14.75
Beryllium aluminum, 5% Be; dollars per lb contained Be	$27.50
Cadmium, del'd	$1.50
Cobalt, 97-99% (per lb)	$1.50 to $1.57
Copper, electro, Conn. Valley	19.50
Copper, lake, Conn. Valley	19.625
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$110.00
Lead, St. Louis	12.35
Lead, New York	12.55
Magnesium, 99.8 + %	20.50
Magnesium, sticks, carlots	36.00
Mercury, dollars per 76-lb flask, f.o.b. New York	$87 to $88
Nickel, electro, f.o.b. refinery	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per troy oz.	$60 to $65
Silver, New York, cents per oz.	83.75
Tin, Straits, New York	70.00
Zinc, East St. Louis	10.50
Zinc, New York	10.94
Zirconium copper, 6 pct Zr, per lb contained Zr	$ 6.00

Remelted Metals

Brass Ingot

(Cents per lb, in carloads)

85-5-5-5 ingot	
No. 115	20.50
No. 120	20.00
No. 123	19.50
80-10-10 ingot	
No. 305	23.50
No. 315	22.00
88-10-2 ingot	
No. 210	25.75
No. 215	24.75
No. 245	21.75
Yellow ingot	
No. 405	16.25
Manganese Bronze	
No. 421	18.25

Aluminum Ingot

(Cents per lb, lots of 30,000 lb)

95-5 aluminum-silicon alloys:	
0.30 copper, max.	17.50—17.75
0.60 copper, max.	17.00—17.50
Piston alloys (No. 122 type)	16.25—17.00
No. 12 alum. (No. 2 grade)	16.00—16.75
108 alloy	16.00—16.75
195 alloy	16.75—17.50
AXS-679	16.50—16.75
Steel deoxidizing aluminum, notch-bar, granulated or shot.	
Grade 1—95 pct-97½ pct	16.50
Grade 2—92 pct-95 pct	16.00
Grade 3—90 pct-92 pct	15.50
Grade 4—85 pct-90 pct	15.25—15.50

Electroplating Supplies

Anodes

(Cents per lb, f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	34⅞
Electrodeposited	28⅝
Rolled, oval, straight delivered	29⅛
Curved, 18 in. or longer, delivered	29⅛
Brass, 80-20, frt allowed	
Cast, oval, 15 in. or longer	31⅜
Zinc, Cast, 99.99	18¾
Nickel, 99 pct plus, frt allowed	
Cast	51
Rolled, depolarized	52
Silver, 999 fine	
Rolled, 1000 oz lots, per oz.	90.00

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum	34.00
Copper sulphate, 99.5, crystals, bbls	7.75
Nickel salts, single, 425 lb bbls, frt allowed	14.50
Silver cyanide, 100 oz lots, per oz	74.5
Sodium cyanide, 96 pct, domestic, 100 lb drums	15.00
Zinc cyanide, 100 lb drums	33.00
Zinc, sulphate, 89 pct, crystals, bbls, frt allowed	.0635

Mill Products

Aluminum

(Cents per lb, base, subject to extras for quantity, gage, size, temper and finish)

Drawn tubing: 2 to 3 in. OD by 0.065 in. wall: 3S, 43.5¢; 52S-O, 67¢; 24S-T, 71¢; base, 30,000 lb.

Plate: ¼ in. and heavier: 2S, 3S, 21.2¢; 52S, 24.2¢; 61S, 23.8¢; 24S, 24S-AL, 24.2¢; 75S, 75S-AL, 30.5¢; base, 30,000 lb.

Flat Sheet: 0.136-in. thickness: 2S, 3S, 23.7¢; 52S, 27.2¢; 61S, 24.7¢; 24S-O, 24S-OAL, 26.7¢; 75S-O, 75S-OAL, 32.7¢; base, 30,000 lb.

Extruded Solid Shapes: factor determined by dividing the perimeter of the shape by its weight per foot. For factor 1 through 4, 3S, 26¢; 14S, 32.5¢; 24S, 35¢; 53S, 61S, 28¢; 63S, 27¢ 75S, 45.5¢; base, 30,000 lb.

Wire, Rod and Bar: screw machine stock, rounds, 17S-T, ¼ in., 29.5¢; ½ in., 37.5¢; 1 in., 26¢; 2 in., 24.5¢; hexagons, ¼ in., 35.5¢; ½ in., 30¢; 1in., 2 in., 27¢; base, 5000 lb. *Rod:* 2S, 3S, 1¼ to 2½ in. diam, rolled, 23¢; cold-finished, 23.5¢ base, 30,000 lb. *Round Wire:* drawn, coiled, B & S gage 17-18: 2S, 3S, 33.5¢; 56S, 39.5¢; 10,000 lb base; B & S gage 00-1: 2S, 3S, 21¢; 56S, 30.5¢. B & S 15-16: 2S, 3S, 32.5¢; 56S, 38¢; base, 30,000 lb.

Magnesium

(Cents per lb, f.o.b. mill)

Sheet and Plate: Ma, FSa, ¼ in.,54¢-56¢; 0.188 in., 56¢-58¢; B & S gage 8, 58¢-60¢; 10, 59¢-61¢; 14, 69¢-74¢; 16, 79¢-81¢; 18, 87¢-89¢; 22, $1.25-$1.31; 24, $1.71-$1.75. Base quantity, 30,000 lb.

Round Rod: M, diam in. ⅛, 55¢; ¼, 47¢; ⅜, 46¢; ½, 45¢; ¾, 44¢; 1¾, 43.5¢; 2, 42.5¢; 3, 41.5¢; 4, 42.5¢ 5, 43.5¢; 6 & 7 in., 44¢. Base price, 5000-10,000 lb.

Square and Hexagonal Bar: M, diam in. ⅛, 58¢; ¼, 50¢; ⅜, 48¢; ½, 47.5¢; ¾, 46.5¢; 1¾, 45.5¢; 2, 44.5¢; 3, 43.5¢; 4 & 5 in. 44.5¢; 6 & 7 in., 45¢. Base quantity, 5000-10,000 lb.

Tubing: Varies with wall thickness and outside diameter.

Nickel and Monel

(Cents per lb, f.o.b. mill)

	Nickel	Monel
Sheets, cold-rolled	54	43
No. 35 sheets	..	41
Strip, cold-rolled	60	44
Rod		
Hot-rolled	50	39
Cold-drawn	55	44
Angles, hot-rolled	50	39
Plates	52	41
Seamless tubes	83	71
Shot and blocks	..	31

Zinc

(Cents per lb, f.o.b. mill)

Sheet, l.c.l.	15.40
Ribbon, ton lots	14.50
Plates	
Small	13.25
Large, over 12 in.	14.25
Lithographic, ungrained	17.25

Copper, Brass, Bronze

(Cents per lb)

	Extruded Shapes	Rods	Sheets
Copper	30.78	....	30.93
Copper, hot-rolled	....	27.23	....
Copper, drawn	....	28.28	....
Low brass, 80 pct	37.52	28.71	29.02
High brass	36.03	27.22	27.53
Red brass, 85 pct	38.03	29.22	29.53
Naval brass	27.50	26.25	32.19
Brass, free cutting	....	22.28	....
Commercial bronze	39.06	30.25	30.56
Manganese bronze	31.07	29.57	35.69
Phosphor bronze, 5 pct	....	49.07	48.82
Muntz metal	27.19	25.94	30.38
Everdur, Herculoy Olympic, etc.	34.45	34.73	35.79
Nickel silver, 5 pct	....	38.11	36.34
Architectural bronze	26.01	....	....

Scrap Metals

(Dealers' buying prices, f.o.b. New York)

Copper and Brass

(Cents per lb)

No. 1 heavy copper and wire	14¾—15¼
No. 2 heavy copper and wire	13¾—14¼
Light copper	12¼—12¾
Auto radiators (unsweated)	11¼—11¾
No. 1 composition	14 —14½
No. 1 composition turnings	13 —13½
Clean red car boxes	11 —11½
Cocks and faucets	11½—12
Mixed heavy yellow brass	9 — 9½
Old rolled brass	8¾— 9¼
Brass pipe	10¼—10¾
New soft brass clippings	11 —11½
Brass rod ends	9¾—10¼
No. 1 brass rod turnings	10 —10½

Aluminum

(Cents per lb)

Alum. pistons with struts	4½— 5
Aluminum crankcases	7½— 8
2S aluminum clippings	8¼— 8½
Old sheet & utensils	7½— 8
Mixed borings and turnings	3 — 3¼
Misc. cast aluminum	7 — 7½
Dural clips (24S)	6 — 6½

Zinc

(Cents per lb)

New zinc clippings	7 — 7½
Old zinc	5¼— 5¾
Zinc routings	3 — 3⅛
Old die cast scrap	3 — 3¼

Nickel and Monel

(Cents per lb)

Pure nickel clippings	21 —22
Clean nickel turnings	17 —18
Nickel anodes	19½—20½
Nickel rod ends	20 —21
New Monel clippings	14 —15
Clean Monel turnings	10 —11
Old sheet Monel	12 —12½
Old Monel castings	10 —11
German silver clippings, mixed	10½—11
German silver turnings, mixed	7 — 7¼

Lead

(Cents per lb)

Soft scrap lead	10¾—11
Battery plates (dry)	5¼— 5½

Miscellaneous

(Cents per lb)

Block tin	60
No. 1 pewter	46 —48
No. 1 auto babbitt	36 —37
Mixed common babbitt	12 —12⅛
Solder joints	13½—14
Siphon tops	38
Small foundry type	16 —16½
Monotype	13½—14
Lino and stereotype	13 —13½
Electrotype	11 —11½
New type shell cuttings (nom.)	12 —12½
Clean hand picked type shells	5½— 6
Lino and stereo dross	6 — 6½
Electro dross	4 — 4½

Lead Products

(Cents per lb)

F.o.b. shipping point freight collect. Freight equalized with nearest free delivery point.

Full lead sheets	15.80
Cut lead sheets	16.30
Lead pipe, manufacturing point	15.05
Lead traps and bends	List +35%
Combination lead and iron bends and ferrules, also combination lead and iron ferrules	List +35%
Drum traps, U.S. list	List +35%
Montclair traps	List +35%
Lead wool	17.05

Prices Firm, Shipments Slow as Year Closes

New York

• • • **With a number of** the major steel consumers out of the market for part of the past week, the scrap trade went through its usual dull holiday season. No advances were registered in heavy openhearth grades, but the lighter end of the list made some gains to bring this material into line with its normal relationship with No. 1 steel.

Many steel mill operators had hoped that the return of free markets would see the end of long hauls on scrap, but to date they have been disappointed. It is felt in most quarters that the practice will continue until demand comes somewhat nearer to supply. Meanwhile there are frequent and substantial shipments from remote points and consumers have been obliged to pay as much as $3 or $4 over the district markets for remote scrap.

The year ended with shipments dull, prices firm and some hopes that the new year would bring out a larger volume of material. The latter is the theory of those who assert that dealers had generally attained such high income tax brackets that they found it advisable to hold back on shipments. Some larger yard operators have scouted this theory, saying that since yard overhead and wages go on as usual there was nothing to be gained by holding off on shipments.

It has not yet been possible to measure the effects of the scrap price increases made in the past few months though from a number of sources there are indications that the net effect was not especially significant, especially in the openhearth grades. While there has been some talk of still further price increases, there is no evidence at hand to prove that they would have any economic justification—that is, price boosts would not substantially increase the volume moving to the mills.

Cast grades continue so critically short that few foundrymen expect to have a happy new year unless there is a definite change for the better. Shipbreaking scrap and surplus scrappable machine tools would, it is argued, be of some help but prospects of good gains from these sources appear somewhat remote.

•

PITTSBURGH — A strong undertone continues in the scrap market in this area, but price advances have been halted. A willingess to buy at present prices has been forestalled somewhat by a dealer unwillingness to release what scrap is held. Observers feel that the turn of the year should see scrap movement pick up somewhat, with no particular weakness in price. Except for the strike possibility, there appears to be nothing in the near future that will curb scrap demand or cause a break in the prices. Consumers will resist any further price increases, but only time will tell whether or not their resistance will be successful. With scrap coming in more and more on a "delivered to the consumer" price basis, normal grade differentials are being reestablished. The advances in the prices of turning grades this week were more of an adjustment of grade differentials than an actual price increase. Turnings seem to be moving in better volume now than they have for some time.

•

CHICAGO—The confusion of last week has been clarified with large buyers standing firm on the going prices. Springboarded scrap continues to come in from remote areas with the large tonnages coming out of Texas and the Southwest. Considerably more effort is being made to honor all the terms of contracts which in the past weeks ave not always been found valid as the new higher prices appeared.

•

PHILADELPHIA — Scrap prices held firm in this district last week. The trade is speculating on the reaction of the mills to the increased freight rate which will go into effect on Jan. 1. Some factors expect that consumers may be expected to resist higher prices for scrap to compensate for the freight increase. Scrap is reported to be moving in good volume but consumers are taking all that is offered. Dealers are reported to be not pushing shipments, preferring to await the end of the year in order to hold down the year's income figures.

•

BUFFALO—The market cooled off last week after another leading consumer had stirred things up with an order for about 10,000 tons of openhearth steel at $29.00. Business in machine shop turnings and other light grades was barred by a $2.00 gap between buyers' and sellers' ideas. Movement remained moderate but everyone is looking for improvement in the new year. Cast scrap was in a muddle with one leading melter withdrawn from the market and a second big foundry refusing to pay more than $32.50 f.o.b.

•

BOSTON—A further markup in prices for heavy steel, shoveling and machine shop turnings as well as mixed turnings and borings has been made, and the market is very strong with talk, but no sales, of selected No. 1 heavy melting at $26.50. Quotations on chemical borings have failed to follow those of other materials for the reason that interests outside New England will not quote a price. The overall movement of scrap is increasing, but cast is still difficult to obtain.

•

NEW YORK—Since many of the major consumers were out of this market during the past week activity here fell off considerably. Prior to this the recent price rise resulted in a slight increase in shipments. It can now be confirmed that the New York market, like most others, permits purchasers to buy at several different prices so that there is now a $1 spread between prices being paid by buyers of the openhearth grades.

•

CLEVELAND — With a number of plants closed over the holidays, very little scrap is coming out, and the trade is digging around hard to find enough to keep moving. Mills generally are in fair inventory position, although shipments the last few days have been somewhat lackadaisical. Very little scrap is being sold by the government despite the hue and cry and the very acute needs of industry, particularly the foundries. In some districts there are probably enough old over-age surplus machine tools in warehouses to relieve the foundry scrap situation for the next 6 months if this scrap could only be made available.

•

ST. LOUIS — The sharp advances in scrap iron in the St. Louis market since the OPA ceilings were dropped has not improved the movement to the extent that had been expected. Some country dealers are holding for still higher prices. An increase in shipments is expected after the turn of the year, when a new tax period begins.

•

CINCINNATI—Dealers and brokers in this area indicated that prices for all grades have taken an upswing. Consumers indicate that scrap is still scarce and that the higher prices are not bringing any more scrap into their inventories. Although consumers indicate that they are being asked prices as high as $35.00 they are refusing to buy under such conditions and will if necessary curtail operations in an effort to bring prices down to normal.

•

BIRMINGHAM — Strong pressure is being exerted here to keep scrap prices from continuing to soar. The larger pipe shops and foundries are currently refusing to pay prices for cast grades that dealers claim they can obtain in small shipments leaving this district for other points. Despite the high prices general no unusually heavy flow of material to dealers' yards is being noted.

Correction

Chicago

• • • Due to an unusual set of circumstances including going to press early for the holidays and insufficient information on the market, the openhearth grades quoted in the issue of Dec. 26 at Chicago as $32.00 to $32.50 have been corrected to $30.00 to $30.50. Low phos grades have been corrected.

IRON AND STEEL SCRAP PRICES

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$32.00 to $32.50
RR. hvy. melting	33.00 to 33.50
No. 2 hvy. melting	32.00 to 32.50
RR. scrap rails	33.50 to 34.00
Rails 3 ft. and under	35.00 to 36.00
No. 1 comp'd bundles	32.00 to 32.50
Hand bdld. new shts.	32.00 to 32.50
Hvy. axle turn.	31.50 to 32.00
Hvy. steel forge turn.	31.50 to 32.00
Mach. shop turn.	27.50 to 28.00
Short shov. turn.	29.00 to 29.50
Mixed bor. and turn.	28.00 to 28.50
Cast iron borings	28.00 to 28.50
No. 1 cupola cast	38.00 to 39.00
Heavy breakable cast	30.00 to 32.00
Malleable	38.00 to 39.00
RR. knuck, and coup.	36.50 to 37.50
RR. coil springs	36.50 to 37.50
Rail leaf springs	36.50 to 37.50
Rolled steel wheels	36.50 to 37.50
Low phos.	34.50 to 35.00

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$30.00 to $30.50
No. 2 hvy. melting	30.00 to 30.50
No. 1 bundles	30.00 to 30.50
No. 2 dealers' bndls.	30.00 to 30.50
Bundled mach. shop turn.	30.00 to 30.50
Galv. bundles	23.00 to 23.50
Mach. shop turn.	24.50 to 25.00
Short shovels, turn.	26.50 to 27.00
Cast iron borings	22.50 to 23.00
Mix. borings & turn.	24.50 to 25.00
Los. phos. hvy. forge	33.00 to 33.50
Low phos. plates	32.00 to 32.50
No. 1 RR. hvy. melt.	30.50 to 31.00
Reroll rails	35.50 to 36.00
Miscellaneous rails	34.50 to 35.00
Angles & splice bars	35.50 to 36.00
Locomotive tires, cut	35.00 to 37.00
Cut bolsters & side frames	32.00 to 32.50
Standard stl. car axles	32.00 to 32.50
No. 3 steel wheels	32.50 to 33.00
Couplers & knuckles	32.50 to 33.00
Malleable	43.00 to 45.00
No. 1 mach. cast	42.00 to 46.00
Rails 3 ft. and under	37.00 to 37.50
No. 1 agricul. cast	35.00 to 36.00
Hvy. breakable cast	35.00 to 36.00
RR. grate bars	35.00 to 35.50
Cast iron brake shoes	35.00 to 35.50
Stove plate	36.00 to 36.50
Clean auto cast	37.00 to 37.50
Cast iron carwheels	35.00 to 35.50

CINCINNATI

Per gross ton delivered to consumer:

Cast grades f.o.b. shipping point

No. 1 hvy. melting	$28.50 to $29.00
No. 2 hvy. melting	28.50 to 29.00
No. 1 bundles	28.50 to 29.00
No. 2 bundles	28.50 to 29.00
Mach. shop turn.	23.50 to 24.00
Shoveling turn.	24.50 to 25.00
Cast iron borings	23.50 to 24.00
Mixed bor. & turn.	23.50 to 24.00
Low phos. plate	30.50 to 31.00
No. 1 cupola cast	33.00 to 35.00
Hvy. breakable cast	31.00 to 33.00
Stove plate	28.00
Scrap rails	26.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$25.00 to $25.50
No. 2 hvy. melting	25.00 to 25.50
Nos. 1 and 2 bundles	25.00 to 25.50
Busheling	25.00 to 25.50
Turnings, shovelings	20.00 to 21.00
Machine shop turn.	18.50 to 19.00
Mixed bor. & turn.	18.50 to 19.00
Cl'n cast. chem. bor.	18.06 to 18.81
No. 1 machinery cast	40.00 to 45.00
No. 2 machinery cast	40.00 to 45.00
Heavy breakable cast	40.00
Stove plate	40.00 to 45.00

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$27.50 to $28.00
No. 2 hvy. melting	27.50 to 28.00
No. 1 bundles	27.50 to 28.00
New busheling	27.50 to 28.00
Flashings	27.50 to 28.00
Mach. shop turn	20.00 to 21.00
Short shov. turn.	22.00 to 22.50

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Pending establishment of a market in some districts and in certain grades, the former OPA ceiling price is inserted for reference, followed by an asterisk.

Cast iron borings	$21.50 to $22.00
Mixed bor. & turn.	21.00 to 21.50
Low phos. plate	30.00 to 30.50
No. 1 cupola cast	42.00 to 45.00
Charging box cast	41.00 to 44.00
Hvy. breakable cast	38.00 to 40.00
Stove plate	38.00 to 40.00
Automotive cast	43.00 to 45.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$30.50 to $31.50
No. 2 hvy. melting	30.50 to 31.50
No. 1 bundles	30.50 to 31.50
No. 2 bundles	30.50 to 31.50
Mach. shop turn.	23.00 to 24.00
Shoveling turn.	23.00 to 23.50
Cast iron borings	23.00 to 24.00
Mixed bor. & turn.	23.00 to 24.00
No. 1 cupola cast	41.00 to 42.00
Hvy. breakable cast	40.00 to 41.00
Cast. charging box	40.00 to 41.00
Clean auto cast	41.00 to 42.00
Hvy. axle forge turn	30.50 to 31.50
Low. phos. plate	33.50 to 34.50
Low phos. punchings	33.50 to 34.50
RR. steel wheels	33.00 to 35.00
RR. coil springs	33.00 to 35.00
RR. malleable	35.00 to 40.00

ST. LOUIS

Per gross ton delivered to consumer:

No. 1 hvy. melting	$28.25 to $28.75
Bundled sheets	28.25 to 28.75
Mach. shop turn.	23.25 to 23.75
Locomotive tires, uncut	29.00 to 30.00
Misc. std. sec. rails	32.00 to 34.00
Rerolling rails	34.00 to 35.00
Steel angle bars	30.00 to 31.00
Rails 3 ft. and under	35.00 to 36.00
RR. springs	31.00 to 32.00
Steel car axles	30.00 to 31.00
Stove plate	30.00 to 35.00
Grate bars	30.00 to 32.50
Brake shoes	25.00 to 26.00
Malleable	38.00 to 40.00
Cast iron carwheels	32.00 to 33.00
No. 1 mach'ery cast.	35.00 to 40.00
Breakable cast	25.00 to 27.50

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$27.00 to $27.50
No. 2 hvy. melting	27.00 to 27.50
No. 2 bundles	27.00 to 27.50
No. 1 busheling	27.00 to 27.50
Long turnings	17.00 to 18.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	17.00 to 18.00
Bar crops and plate	28.00 to 29.00
Structural and plate	28.00 to 29.00
No. 1 cast	34.00 to 38.00
Stove plate	30.00 to 35.00
Steel axles	29.00 to 30.00
Scrap rails	28.00 to 29.00
Rerolling rails	30.00 to 31.00
Angles & splice bars	30.00 to 31.00
Rails 3 ft & under	31.00 to 32.00
Cast iron carwheels	29.50 to 30.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$32.00 to $32.50
No. 2 hvy. melting	32.00 to 32.50
Low phos. plate	34.00 to 34.50
No. 1 busheling	32.00 to 32.50
Hydraulic bundles	32.00 to 32.50
Mach. shop turn.	26.50 to 27.00
Short. shovel. turn.	26.50 to 27.00
Cast iron borings	27.00 to 27.50
Elec. furnace punch	34.00 to 34.50

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$25.50 to $26.50
No. 2 hvy. melting	25.50 to 26.50
Comp. black bundles	25.50 to 26.50
Comp. galv. bundles	23.50
Mach. shop turn.	20.50
Mixed bor. & turn.	20.50
Shoveling turn.	22.25
No. 1 cupola cast	$36.00 to 37.00
Hvy. breakable cast	32.00 to 35.00
Charging box cast	$36.00 to $37.00
Stove plate	36.00 to 37.00
Clean auto cast.	36.00 to 37.00
Unstrip. motor blks.	25.00 to 27.00
Cl'n chem. cast bor.	19.33

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$28.50 to $29.00
No. 1 bundles	28.50 to 29.00
No. 2 bundles	28.50 to 29.00
No. 2 hvy. melting	28.50 to 29.00
Mach. shop turn.	18.75 to 19.25
Shoveling turn.	20.75 to 21.25
Cast iron borings	19.75 to 20.25
Mixed bor. & turn.	18.75 to 19.25
No. 1 cupola cast	35.00 to 40.00
Charging box cast	30.00
Stove plate	30.00 to 35.00
Clean auto cast	35.00 to 40.00
Malleable	33.00 to 33.50
Low. phos. plate	31.00 to 32.00
Scrap rails	29.75 to 30.25
Rails 3 ft. & under	31.75 to 32.25
RR. steel wheels	32.75 to 33.25
Cast iron carwheels	31.00 to 31.50
RR. coil & leaf spgs.	32.75 to 33.25
RR. knuckles & coup.	32.75 to 33.25
No. 1 busheling	28.50 to 29.00

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$30.00 to $30.50
No. 2 hvy. melting	30.00 to 30.50
Compressed sheet stl.	30.00 to 30.50
Drop forge flashings	30.00 to 30.50
No. 2 bundles	30.00 to 30.50
Mach. shop turn.	25.00 to 25.50
Short shovel	25.00 to 25.50
No. 1 busheling	30.00 to 30.50
Steel axle turn.	30.00 to 30.50
Cast iron borings	25.00 to 25.50
Mixed bor. & turn.	25.00 to 25.50
No. 1 machinery cast	37.50 to 40.00
Malleable	34.50 to 35.00
Railroad cast	37.50 to 40.00
Railroad grate bars	30.00 to 30.50
Stove plate	34.50 to 35.00
RR. hvy. melting	30.00 to 30.50
Rails 3 ft. & under	34.00 to 34.50
Rails 18 in. & under	36.00 to 36.50
Rails for rerolling	33.00 to 33.50
Elec. furnace punch	32.00 to 32.50

SAN FRANCISCO

Per gross ton delivered to consumer:

Cast grade f.o.b. shipping point

No. 1 hvy. melting	$19.50
No. 2 hvy. melting	19.50
No. 2 bales	19.50
No. 3 bales	16.00
Mach. shop turn.	13.00
Elec. furn. 1 ft. und.	19.50*
No. 1 cupola cast.	25.00*
RR. hvy. melting	20.50

LOS ANGELES

Per gross ton delivered to consumer:

Cast grade f.o.b. shipping point

No. 1 hvy. melting	$19.50
No. 2 hvy. melting	19.50
No. 1 bales	19.50
No. 2 bales	19.50
No. 3 bales	16.00
Mach. shop turn.	13.00
No. 1 cupola cast	25.00
RR. hvy. melting	20.50

SEATTLE

Per gross ton delivered to consumer:

Cast grade f.o.b. shipping point

No. 1 & No. 2 hvy. melting	$17.00
Elec. furn. 1 ft. und.	17.00
No. 1 cupola cast	25.00*
RR. hvy. melting	16.00

HAMILTON, ONT.

Per gross ton delivered to consumer:

Cast grades f.o.b. shipping point

Heavy melting	$17.50*
No. 1 bundles	17.50*
No. 2 bundles	17.00*
Mixed steel scrap	15.50*
Rails, remelting	18.50*
Rails, rerolling	21.50*
Bushelings	13.00*
Mixed borings & turnings	12.50*
Electric furnace bundles	20.50*
Manganese steel scrap	20.00*
No. 1 cast	19.00*
Stove plate	17.50*
Car wheels, cast	19.50*
Malleable iron	16.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**, declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	Dec. 31, 1946	Dec. 24, 1946	Nov. 26, 1946	Jan. 1, 1946
Hot-rolled sheets	2.50	2.50	2.425	2.20
Cold-rolled sheets	3.20	3.20	3.275	3.05
Galvanized sheets (10 ga.)	3.55	3.55	4.05	3.70
Hot-rolled strip	2.50	2.50	2.35	2.10
Cold-rolled strip	3.20	3.20	3.05	2.80
Plates	2.50	2.50	2.50	2.25
Plates, wrought iron	5.95	5.95	5.95	3.80
Stain's c-r strip (No. 302)	30.30	30.30	30.30	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes..	$5.00	$5.00	$5.00	$5.00
Tinplate, electro (0.50 lb)	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.60	2.60	2.50	2.25
Cold-finished bars	3.10	3.10	3.10	2.75
Alloy bars	3.05	3.05	2.92	2.70
Structural shapes	2.35	2.35	2.35	2.10
Stainless bars (No. 302)	25.97	25.97	25.97	24.00
Wrought iron bars	6.15	6.15	6.15	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	3.05	3.05	3.05	2.75
Wire nails	3.75	3.75	3.75	2.90
Rails: (dollars per 100 lb)				
Heavy rails	$2.50	$2.50	$43.39†	$43.00*
Light rails	2.85	2.85	49.18†	45.00*
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$39.00	$39.00	$39.00	$36.00
Sheet bars	38.00	38.00	38.00	36.00
Slabs, rerolling	39.00	39.00	39.00	36.00
Forging billets	47.00	47.00	47.00	42.00
Alloy blooms, billets, slabs	61.00	61.00	58.43	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.55	2.55	2.30	2.15
Skelp	2.05	2.05	2.05	1.90

*per gross ton †per net ton

Pig Iron: (per gross ton)	Dec. 31, 1946	Dec. 24, 1946	Nov. 26, 1946	Jan. 1, 1946
No. 2, foundry, Phila.	$32.43	$32.43	$30.43	$27.59
No. 2, Valley furnace	30.50	30.50	28.50	25.75
No. 2, Southern, Cin'ti	29.80	29.80	27.80	26.19
No. 2, Birmingham	26.88	26.88	24.88	22.13
No. 2 foundry, Chicago†	30.50	30.50	28.50	25.75
Basic, del'd eastern Pa.	31.93	31.93	29.93	27.09
Basic, Valley furnace	30.00	30.00	28.00	25.25
Malleable, Chicago†	30.50	30.50	28.50	25.75
Malleable, Valley	30.50	30.50	28.50	25.75
Charcoal, Chicago	42.99	42.99	42.34	42.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh.	$32.25	$32.25	$25.25	$20.00
Heavy melt'g steel, Phila.	31.00	31.00	24.50	18.75
Heavy melt'g steel, Ch'go	30.25	30.25*	25.25	18.75
No. 1 hy. comp. sheet, Det.	27.75	28.50	22.32	17.32
Low phos. plate, Youngs'n	34.25	34.25	27.75	22.50
No. 1, cast, Pittsburgh	37.50	37.50	29.00	20.00
No. 1, cast, Philadelphia	41.50	41.50	40.50	20.00
No. 1, cast, Chicago	44.00	44.00	37.75	20.00

*Revised.

Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$8.75	$8.75	$8.75	$7.50
Foundry coke, prompt	8.50	8.50	8.50	9.00

Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	19.50	19.50	19.50	12.00
Copper, Lake, Conn.	19.625	19.625	19.50	12.00
Tin, Straits, New York	70.00	70.00	70.00	52.00
Zinc, East St. Louis	10.50	10.50	10.50	8.25
Lead, St. Louis	12.35	12.35	11.65	6.35
Aluminum, virgin	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	28.25	28.25	23.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 31, 1946	2.83599¢ per lb.	$30.14 per gross ton	$31.17 per gross ton
One week ago	2.75655¢ per lb.	$30.14 per gross ton	$31.17* per gross ton
One month ago	2.70711¢ per lb.	$28.13 per gross ton	$25.00 per gross ton
One year ago	2.44104¢ per lb.	$25.37 per gross ton	$19.17 per gross ton

	HIGH	LOW	HIGH	LOW	HIGH	LOW
1946	2.83599¢ Dec. 31	2.54490¢ Jan. 1	$30.14 Dec. 10	$25.37 Jan. 1	$31.17 Dec. 24*	$19.17
1945	2.44104¢ Oct. 2	2.38444¢ Jan. 2	25.37 Oct. 23	23.61 Jan. 2	19.17 Jan. 2	$18.92 May 22
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17 Jan. 11	15.76 Oct. 24
1943	2.29176¢	2.29176¢	23.61	23.61	$19.17	$19.17
1942	2.28249¢	2.28249¢	23.61	23.61	19.17	19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 15
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 9
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 8
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia, and Chicago. *Revised.

Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Commercial quality sheet grade; primes, 25¢ above base. (2) Commercial quality grade. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 lb to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6 (14) Billets only. (15) 9/32 in. to 47/64 in., 0.10¢ per lb higher.

Basing Points	Pitts-burgh	Chicago	Gary	Cleve-land	Birm-ingham	Buffalo	Youngs-town	Spar-rows Point	Granite City	Middle-town, Ohio	Gulf Ports, Cars	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Phila-delphia
INGOTS Carbon, rerolling	($33.00 f. o. b. mill)														
Carbon, forging	$38	$38	$38	$38	$38	$38	$38								
Alloy	$52.00	$52.00				$52.00	(Bethlehem, Massillon, Canton, Coatesville=$52.00)								
BILLETS, BLOOMS, SLABS Carbon, rerolling	(Provo=$50.20, Duluth=$41[14]) $39	$39	$39	$39	$39	$39	$39	$39				$51.50[14]	$41.50		
Carbon, forging billets	(Provo=$58.20, Duluth=$49[14]) $47	$47	$47	$47	$47	$47	$47					$59.50[14]	$49.50		
Alloy	$61.00	$61.00				$61.00	(Bethlehem, Massillon, Canton=$61.00)						$63.50		
SHEET BARS	$38	$38		$38		$38	$38	$38	(Canton=$38)						
PIPE SKELP	2.05¢	2.05¢					2.05¢	2.05¢	(Coatesville=2.05¢)						
WIRE RODS [15] No. 5 to 9/32 in.	2.55¢	2.55¢		2.55¢	2.55¢	(Worcester=2.65¢)					2.835¢	3.385¢			
SHEETS Hot-rolled	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.875¢	2.50¢		3.085¢	2.635¢	2.76¢	2.69¢
Cold-rolled [1]	3.20¢	3.20¢	3.20¢	3.20¢		3.20¢	3.20¢		3.30¢			3.885¢	3.335¢	3.560¢	3.560¢
Galvanized (10 gage)	3.55¢	3.55¢	3.55¢		3.55¢	3.55¢	3.55¢	3.55¢	3.65¢			4.135¢		3.81¢	3.74¢
Enameling (12 gage)	3.55¢	3.55¢	3.55¢	3.55¢			3.55¢		3.65¢			4.235¢	3.685¢	3.95¢	3.91¢
Long ternes [2] (10 gage)	3.55¢	3.55¢	3.55¢									4.335¢		3.95¢	3.91¢
STRIP Hot-rolled [3]	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢		2.50¢			2.50¢		3.185¢	2.635¢	2.90¢	2.86¢
Cold-rolled [4]	3.20¢	3.30¢		3.20¢			3.20¢						3.335¢	3.60¢	3.56¢
Cooperage stock	2.55¢	2.55¢			2.55¢		2.55¢							2.95¢	
TINPLATE Standard cokes, base box	$5.00	$5.00	$5.00		$5.10			$5.10	$5.10					$5.375	$5.301[11]
Electro, box 0.25 lb	Deduct 65¢ from standard coke base box price.														
Electro, box 0.50 lb	Deduct 50¢ from standard coke base box price.														
Electro, box 0.75 lb	Deduct 35¢ from standard coke base box price.														
BLACKPLATE 29 gage [5]	3.30¢	3.30¢	3.30¢		3.40¢			3.40¢	3.40¢					3.67¢	3.59¢
TERNES, MFG. Special coated, base box	Deduct 70¢ from standard coke base box price.														
CAN MAKING QUALITY Blackplate 55 to 70 lb	Deduct $1.30 from standard coke base box price.														
BARS Carbon steel	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	(Duluth=2.70¢) (Provo, Utah=3.30¢)			2.985¢	3.235¢	2.735¢	2.94¢	2.96¢
Rail steel [6]	2.75¢	2.75¢	2.75¢	2.75¢	2.75¢	2.75¢					3.135¢	3.435¢			
Reinforcing (billet) [7]	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢			2.835¢	2.885¢	2.585¢	2.71¢	2.79¢
Reinforcing (rail) [7]	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢	2.60¢				2.985¢	3.035¢	2.735¢		
Cold-finished [8]	3.10¢	3.10¢	3.10¢	3.10¢		3.10¢	(Detroit=3.15¢) (Toledo=3.25¢)							3.44¢	3.46¢
Alloy, hot-rolled	3.05¢	3.05¢				3.05¢	3.05¢	(Bethlehem, Massillon, Canton=3.05¢)					3.185¢		
Alloy, cold-drawn	3.62¢	3.62¢	3.62¢	3.62¢		3.62¢							3.765¢		
PLATE Carbon steel [13]	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢		2.50¢	(Coatesville, Claymont=2.50¢ Geneva Utah=2.65¢) 2.50¢			2.885¢	3.085¢	2.755¢	2.71¢	2.558¢
Floor plates	3.75¢	3.75¢									4.135¢	4.435¢		4.15¢	4.15¢
Alloy	3.79¢	3.79¢			(Coatesville=3.79¢)						4.305¢	4.525¢		4.01¢	3.895¢
SHAPES Structural	2.35¢	2.35¢	2.35¢		2.35¢	2.35¢	(Geneva, Utah=2.50¢) (Bethlehem=2.35¢)				2.735¢	3.035¢		2.54¢	2.48¢
SPRING STEEL, C-R 0.26 to 0.50 carbon	3.55¢			3.55¢			(Worcester=3.75¢)								
0.51 to 0.75 carbon	4.80¢			4.80¢			(Worcester=5.00¢)								
0.76 to 1.00 carbon	6.65¢			6.65¢			(Worcester=6.85¢)								
1.01 to 1.25 carbon	8.85¢			8.85¢			(Worcester=9.05¢)								
WIRE [9] Bright [12]	3.05¢	3.05¢		3.05¢	3.05¢		(Worcester=3.15¢) (Duluth=3.10¢)					3.585¢		3.44¢	3.41¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire Base														
Spring (high carbon)	4.00¢	4.00¢		4.00¢			(Worcester=4.10¢) (Trenton=4.25¢)					4.535¢		4.39¢	4.339¢
PILING Steel sheet	2.65¢	2.65¢				2.65¢						3.235¢		2.99¢	3.01¢

CORROSION AND HEAT RESISTANT STEELS

In cents per pound, f.o.b. basing point

BASING POINT	Chromium Nickel		Straight Chromium			
	No. 304	No. 302	No. 410	No. 430	No. 442	No. 446
Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila.	Subject to negotiation			Subject to negotiation		
Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt.	22.99	22.07	17.01	17.47	20.69	25.29
Slabs, P'gh, Chi, Canton, Balt, Phila, Reading	22.99	22.07	17.01	17.47	20.69	25.29
Billets, P'gh, Chi, Canton, Watervliet, Syracuse, Balt.	Subject to negotiation			Subject to negotiation		
Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Watervliet, Syracuse, Ft. Wayne, Titusville	22.99	22.07	17.01	17.47	20.69	25.29
Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Syracuse, Balt, Phila, Reading, Ft. Wayne, Titusville	27.05	25.97	20.02	20.56	24.34	29.75
Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Syracuse, Balt, Phila, Reading Ft. Wayne, Watervliet	27.05	25.97	20.02	20.56	24.34	29.75
Plates, P'gh, Middletown, Canton	31.38	29.21	23.28	23.80	28.67	33.00
Shapes, structural, P'gh, Chi	27.05	25.97	20.02	20.56	24.34	29.75
Sheets, P'gh, Chi, Middletown, Canton, Balt.	38.95	36.79	28.67	31.38	35.16	38.49
Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown	25.43	23.28	18.39	18.93	25.97	37.87
Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown	32.46	30.30	23.80	24.34	34.62	56.26
Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J., Phila.	27.05	25.97	20.02	20.56	24.34	29.75
Wire, flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton	32.46	30.30	23.80	24.34	34.62	56.26
Rod, h-r, Syracuse	27.05	25.97	20.02	20.56	24.34	29.75
Tubing, seamless, P'gh, Chi, Canton, (4 to 6 in.)	72.09	72.09	.....	68.49	.....	.....

TOOL STEEL

*(F.o.b. Pittsburgh, Bethlehem, Syracuse, Dunkirk. *Also Canton, O.)*

An increase of 8.2 pct applies to base price and extras

	Base per lb
High speed	67¢
Straight molybdenum	54¢
Tungsten-molybdenum	57½¢
High-carbon-chromium*	43¢
Oil hardening*	24¢
Special carbon*	22¢
Extra carbon*	18¢
Regular carbon*	14¢

Warehouse prices on and east of Mississippi are 2¢ per lb higher; west of Mississippi 3¢ higher.

ELECTRICAL SHEETS

Base, all grades f.o.b. Pittsburgh

	per lb
Field grade	3.90¢
Armature	4.25¢
Electrical	4.75¢
Motor	5.425¢
Dynamo	6.125¢
Transformer 72	6.625¢
Transformer 65	7.625¢
Transformer 58	8.125¢
Transformer 52	8.925¢

F.o.b. Chicago and Gary, field grade through motor; f.o.b. Granite City, add 10¢ per 100 lb on field grade to and including dynamo. Pacific ports add 75¢ per 100 lb on all grades.

RAILS, TRACK SUPPLIES

(F.o.b. mill)

Standard rails, heavier than 60 lb	
No. 1 O.H., per 100 lb	$2.50
Angle splice bars, 100 lb	3.00
(F.o.b. basing points)	*per 100 lb*
Light rails (from billets)	$2.85
Light rails (from rail steel)	2.75

	Base per lb
Cut spikes	4.50¢
Screw spikes	6.40¢
Tie plate, steel	2.80¢
Tie plates, Pacific Coast	2.95¢
Track bolts	6.50¢
Track bolts, heat treated, to rail roads	6.75¢
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25¢.

ROOFING TERNEPLATE

(F.o.b. Pittsburgh, 112 sheets)

	20x14 in.	20x28 in.
8-lb coating I.C.	$6.25	$12.50

CLAD STEEL

Base prices, cents per pound

	Plate	Sheet
Stainless-clad		
No. 304, 20 pct, f.o.b. Pittsburgh, Washington, Pa.	21.00*	22.00
Nickel-clad		
10 pct, f.o.b. Coatesville, Pa.	18.72	....
Inconel-clad		
10 pct, f.o.b. Coatesville	26.00	....
Monel-clad		
10 pct, f.o.b. Coatesville	24.96	....
Aluminized steel		
Hot dip, 20 gage, f.o.b. Pittsburgh	....	9.00

*Includes annealing and pickling.

WIRE PRODUCTS

To the dealer f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	base per keg	
Standard, galvanized and coated nails	$3.75	$4.25
Cut nails, carloads	4.85	....
	base per 100 lb	
Annealed fence wire	$3.75	$4.00
Annealed galv. fence wire	3.85	4.35
	base column	
Woven wire fence*	79	97
Fence posts, carloads	74	91
Single hoop bale ties	73	98
Galvanized barbed wire**	89	99
Twisted barbless wire	79	89

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

HIGH TENSILE, LOW ALLOY STEELS

base prices, cents per pound

Steel	Aldecor	Corten	Double Strength No. 1	Dynalloy	HI Steel	Mayari R	Otis-coloy	Yoloy	Y-50
Producer	Republic	Carnegie-Illinois, Republic	Republic	Alan Wood	Inland	Bethlehem	Jones & Laughlin	Youngstown Sheet & Tube	American Rolling Mill
Plates	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	.....
Sheets									
Hot-rolled	3.575	3.575	3.575	3.575	3.575	3.575	3.575	3.575	.....
Cold-rolled	4.525	4.525	4.525	.....	4.525	4.525	4.525	4.525	5.225*
Galvanized	.....	.....	.....	.....	.....	5.50	.....	.....	.....
Strip									
Hot-rolled									
Over 6-in.	3.60	3.60	3.60	.....	3.60	3.60	3.60	3.60	.....
6-in & under	3.70	3.70	3.70	.....	3.70	3.70	3.70	3.70	.....
Cold-rolled	4.30	.....	4.30	.....	4.40	.....	4.30	4.30	5.00*
Commodity	.....	.....	.....	.....	.....	.....	4.45	.....	.....
Shapes	.....	3.45	.....	.....	3.45	3.45	3.45	3.45	.....
Beams	.....	3.45	.....	.....	.....	3.45	.....	.....	.....
Bars									
Hot-rolled	3.70	3.70	3.70	.....	.....	3.70	3.70	3.732†‡	.....
Cold-rolled	.....	.....	.....	.....	.....	.....	.....	4.382†‡	.....
Bar shapes	.....	3.85	.....	.....	3.85	3.85	3.85	3.85	.....
Billets, blooms, slabs (per gross ton)									
Structural	.....	.....	.....	.....	.....	.....	.....	$74.65†	.....
Forging	.....	.....	.....	.....	.....	.....	.....	$82.23†	.....

* 21 gage and lighter. † Alloy extras apply. ‡ Add 0.379¢ for forging or heat treating grade.

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe)
Base price—$290.00 per net ton

Steel (buttweld)

	Black	Galv.
½-in.	55½	41
¾-in.	58½	45
1-in. to 3-in.	60½	47½

Wrought Iron (buttweld)

½-in.	2	+20
¾-in.	11½	+10
1-in. and 1¼-in.	17	+ 2
1½-in.	22½	1½
2-in.	23	2

Steel (lapweld)

2-in	58	46½
2½-in. and 3-in.	61	49½
3½-in. to 6-in.	63	51½

Wrought Iron (lapweld)

2-in.	14½	+ 5½
2½-in. to 3½-in.	17	+ 1½
4-in.	21	4
4½-in. to 8-in.	19	2½

Steel (butt, extra strong, plain ends)

½-in.	54½	41½
¾-in.	58½	45½
1-in. to 3-in.	60	48

Wrought Iron (same as above)

½-in.	6½	+14
¾-in.	12½	+ 8
1-in. to 2-in.	22	2

Steel (lap, extra strong, plain ends)

2-in.	56	45½
2½-in. and 3-in.	60	49½
3½-in. to 6-in.	63½	53

Wrought Iron (same as above)

2-in.	17½	+ 2
2½-in. to 4-in.	26	8½
4½-in. to 6-in.	22	4

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots

	Seamless Cold-Drawn	Seamless Hot-Rolled	Lap-weld, Hot-Rolled
2 in. O.D. 13 B.W.G.	$18.17	$15.29	$13.20
2½ in. O.D. 12 B.W.G.	24.43	20.57	17.67
3 in. O.D. 12 B.W.G.	27.18	24.87	19.56
3½ in. O.D. 11 B.W.G.	34.30	28.88	24.68
4 in. O.D. 10 B.W.G.	42.55	35.72	30.55

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft to 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

CAST IRON WATER PIPE

	Per net ton
6-in. to 24-in., del'd Chicago	$74.33
6-in. to 24-in., del'd New York	73.60
6-in. to 24-in., Birmingham	65.00
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles or Seattle for all rail shipment; rail and water shipment less	88.40

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

Add 18 pct for bolts up to ⅝ in. diam and 6 in. long. In larger sizes, add 15 pct.

Base discount less case lots

Percent Off List

½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 pct additional discount. For 200 lb or more, freight allowed up to 50¢ per 100 lb, based on Cleveland, Chicago, Pittsburgh.

Stove Bolts

Consumer

Packages, nuts loose	71 and 10
In packages	71
In bulk	80

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

Large Rivets
(½ in. and larger)

Base per 100 Lb

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$4.75
F.o.b. Lebanon, Pa.	4.90

Small Rivets
(7/16 in. and smaller)

Percent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	55 and 5

Cap and Set Screws

(In packages)	*Consumer*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)

Per Gross Ton

Old range, bessemer	$5.45
Old range, non-bessemer	5.30
Mesabi, bessemer	5.20
Mesabi, non-bessemer	5.05
High phosphorus	5.05

Iron ore exempt from price control by SO 193 effective Nov. 10, 1946.

METAL POWDERS

Prices in cents per pound in ton lots, f.o.b. shipping point.

Brass, minus 100 mesh	23¢ to 27¢
Copper, electrolytic, 100 and 375 mesh	28⅝¢ to 30⅝¢
Copper, reduced, 150 and 200 mesh	22⅜¢
Iron, commercial, 100, 200, 325, mesh 96 + % Fe	11¢ to 16¢
Swedish sponge iron, 100 mesh, c.i.f. N. Y., carlots, ocean bags	7.4¢ to 8¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	5¢
Iron, hydrogen reduced, 300 mesh and finer, 98 + % Fe, drum lots	66¢
Iron, electrolytic, unannealed, 325 mesh and coarser, 99 + % Fe	25¢ to 31¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	17¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢ to $1.75
Aluminum, 100, 200 mesh, carlots	25¢
Antimony, 100 mesh	39¢
Cadmium, 100 mesh	$2.00
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	17.55¢ to 21.05¢
Manganese, minus 325 mesh and coarser	44¢ to 61¢
Nickel, 150 mesh	51½¢
Silicon, minus 325 mesh and coarser	26¢ to 55¢
Solder powder, 100 mesh	8½¢ plus metal
Tin, 100 mesh	58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 100-lb kegs, f.o.b. York, Pa., per lb	$2.65
Under 100 lb	$2.90

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$8.75
Connellsville, Pa., hand drawn	9.35
Foundry, beehive (f.o.b. oven)	
Connellsville, Pa.	8.50
Foundry, Byproduct	
Chicago, del'd	15.10
Chicago, f.o.b.	14.35
New England, del'd	16.04
Kearny, N. J., f.o.b.	14.40
Philadelphia, del'd	14.62
Buffalo, del'd	14.75
Portsmouth, Ohio, f.o.b.	12.85
Painesville, Ohio, f.o.b.	13.50
Erie, del'd	14.50
Cleveland, del'd	14.55
Cincinnati, del'd	14.60
St. Louis, del'd	15.10†
Birmingham, del'd	12.25

†Except producers situated in states other than Missouri, Alabama or Tennessee, sellers may charge a maximum delivered price of $15.60 in the St. Louis Mo., and East St. Louis, Ill., switching districts.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

Carloads Per 1000

Sec. quality, Ohio	57.00
First quality, Pa., Md., Ky., Mo., Ill., Ohio	65.00
First quality, New Jersey	70.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	59.00
Sec. quality, New Jersey	62.00
Sec. quality, Ohio	57.00
Ground fire clay, net ton, bulk	9.50

Silica Brick

Pennsylvania and Birmingham	$65.00
Chicago District	74.00
Silica cement, net ton (Eastern)	11.50
Chicago	12.50

Chrome Brick	*Per Net Ton*
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks	$44.50
Domestic, f.o.b. Chewelah, Wash., in bulk	22.00
in sacks	26.00
Clinker (dead burned) dolomite, bulk, per net ton, f.o.b. York, Pa.	10.05

Midwest, add 10¢; Mo. Valley, add 20¢

WAREHOUSE PRICES

Delivered metropolitan areas, per 100 lb. Prices do not reflect recent price increases or the ICC approved freight rate increases effective Jan. 1.

Cities	SHEETS			STRIP			Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
				Hot-Rolled										
	Hot-Rolled (10 gage)	Cold-Rolled	Galvanized (24 gage)	6 in. and Under	Over 6 in.	Cold-Rolled			Hot-Rolled	Cold-Finished	Hot-Rolled, A-8617-20	Hot-Rolled, A-8742-50 Ann.	Cold-Drawn, A-8617-20	Cold-Drawn, A-8742-50 Ann.
**Philadelphia	$3.774	$5.139	$5.249[a]	$4.314	$4.214	$5.064	$3.875	$3.937	$4.114	$4.564	$6.287	$7.387	$7.664	$8.764
New York	3.856	4.869	5.501	4.375	4.275	5.075	4.049	4.038	4.134	4.584	6.338	7.438	7.684	8.784
Boston	4.05	5.031	5.725	4.518	4.418	4.985	4.203	4.023	4.356	4.656	6.503	7.603	7.756	8.856
Baltimore	3.64	5.118	5.365	4.293	4.193	....	3.865	4.05	4.093	4.543	....	....	....	....
Norfolk	4.037	....	5.862	4.577	4.477	....	4.262	4.303	4.377	4.677	....	....	....	....
Chicago	3.475	4.425	5.40	3.95	3.85	4.90[5]	3.80	....	3.75	4.20	6.05	7.15	7.20	8.30
Milwaukee	3.633	4.583	5.558	4.108	4.008	5.058[5]	3.958	3.958	3.908	4.358	6.308	7.408	7.458	8.558
Cleveland	3.575	....	5.347	3.95	3.85	....	3.65	3.88	3.60	4.20	6.277	7.377	7.20	8.30
Buffalo	3.575	4.625	5.20	4.211	4.111	4.961	3.921	3.65	3.60	4.20	6.05	7.15	7.20	8.30
Detroit	3.71	4.76	5.526	4.085	3.985	4.95	3.935	3.987	3.735	4.285	6.456	7.556	7.585	8.685
Cincinnati	3.671	4.721	5.296	4.046	3.946	5.002	3.952	3.983	3.902	4.502	6.441	7.541	7.602	8.702
St. Louis	3.643	4.593	5.622	4.118	4.018	5.222	3.968	3.968	3.918	4.522	6.472	7.572	7.622	8.722
Pittsburgh	3.575	4.625	5.20	3.95	3.85	4.70	3.65	3.65	3.60	4.20	6.05	7.15	7.20	8.30
St. Paul	3.817	4.767	5.666	4.292	4.192	5.000	4.142	4.142	4.092	4.852	....	8.322	7.952	8.052
Duluth	3.817	4.767	5.666	4.292	4.192	....	4.142	4.142	4.092	....	6.472	6.572	....	....
Omaha	4.045	5.72	6.00	4.52	4.42	....	4.37	4.37	4.32	4.945	....	....	....	....
Indianapolis	3.775	4.825	5.40	4.15	4.05	5.03	3.92	3.92	3.87	4.47	6.17	....	7.32	....
Birmingham	3.675	....	5.20	4.05	3.95	....	3.80	3.80	3.75	4.954	6.414	7.514	7.564	8.614
Memphis	4.221	....	5.746	4.596	4.496	....	4.346	4.346	4.296	4.821	....	....	....	....
New Orleans	4.359*	5.40[1]	5.884	4.734	4.634	....	4.484	4.484*	4.434*	5.175	....	....	....	....
Los Angeles	4.885	6.635[1]	5.585	5.335	5.235	....	4.835	4.735	4.685	6.065	....	....	....	....
San Francisco	4.435	6.035	6.585	4.885	4.785	....	4.535	4.385	4.435	5.815	....	....	....	....
Seattle	4.905[4]	7.305[2]	6.435	4.635	4.535	....	5.035[4]	4.735[4]	4.635[4]	6.265	7.735[6]	8.735[6]	....	9.585[6]
Portland	4.905[3]	....	6.235	5.135	....	....	5.035[3]	4.735[3]	4.735[3]	6.015	7.735	8.885	....	....
Salt Lake City	4.81	....	6.70	5.94	5.84	....	5.29	5.29	5.19	6.49	....	....	....	....

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED: Sheets, 400 to 1999 lb; strip, extras on all quantities; bars, 1500 lb base.

ALLOY BARS: 1000 to 39,999 lb.

GALVANIZED SHEETS: 450 to 1499 lb.

EXCEPTIONS: (1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 10,000 lb; (5) 2000 lb and over; (6) 1000 lb and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

* Add 29.1¢ for sizes not rolled in Birmingham.

** City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

PIG IRON PRICES

Dollars per gross ton. Delivered prices do not reflect the ICC freight rate increase effective Jan. 1.

BASING POINT PRICES					
Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	31.00	31.50	32.00	32.50	....
Birdsboro	31.00	31.50	32.00	32.50	36.00
Birmingham	26.38	26.88	....	....	....
Buffalo	30.00	30.50	31.00	31.50	....
Chicago	30.00	30.50	30.50	31.00	....
Cleveland	30.00	30.50	30.50	31.00	....
Detroit	30.00	30.50	30.50	31.00	....
Duluth	30.50	31.00	31.00	31.50	....
Erie	30.00	30.50	31.00	31.50	....
Everett	29.00	29.50	30.00	30.50	....
Granite City	30.00	30.50	30.50	31.00	....
Hamilton	28.00	28.50	28.50	....	....
Neville Island	30.00	30.50	30.50	31.00	....
Provo	30.00	30.50	....	....	....
Sharpsville	30.00	30.50	30.50	31.00	....
Sparrows Point	31.00	31.50	....	....	....
Steelton	31.00	....	....	....	36.00
Swedeland	31.00	31.50	32.00	32.50	....
Toledo	30.00	30.50	30.50	31.00	....
Youngstown[1]	30.00	30.50	30.50	31.00	....

DELIVERED PRICES (BASE GRADES)							
Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$0.50 Arb.	29.50	30.00	30.50	31.00	....
Boston	Birdsboro-Steelton	4.47	....	....	....	....	40.47
Brooklyn	Bethlehem	2.78	33.78	34.28	34.78	35.28	....
Brooklyn	Birdsboro	3.26	....	....	....	....	39.26
Canton	Clev., Ygstn., Sharpsville	1.54	31.54	32.04	32.04	32.54	....
Canton	Buffalo	3.55	....	....	....	....	....
Cincinnati	Birmingham	4.30	30.68	31.18	....	....	....
Cincinnati	Hamilton	1.24	....	....	29.74	....	....
Cincinnati	Buffalo	4.89	....	....	....	....	....
Jersey City	Bethlehem	1.70	32.70	33.20	33.70	34.20	....
Jersey City	Birdsboro	2.16	....	....	....	....	38.16
Los Angeles	Provo	5.25	35.25	35.75	....	....	....
Los Angeles	Buffalo	16.33	....	....	....	....	....
Mansfield	Cleveland-Toledo	2.16	32.16	32.66	32.66	33.16	....
Mansfield	Buffalo	3.74	....	....	....	....	....
Philadelphia	Swedeland	0.93	31.93	32.43	32.93	33.43	....
Philadelphia	Birdsboro	1.38	....	....	....	....	37.38
San Francisco	Provo	5.25	35.25	35.75	....	....	....
San Francisco	Buffalo	16.33	....	....	....	....	....
Seattle	Provo	5.25	35.25	35.75	....	....	....
Seattle	Buffalo	16.33	....	....	....	....	....
St. Louis	Granite City	0.50 Arb.	30.50	31.00	31.00	31.50	....
St. Louis	Buffalo	7.86	....	....	....	....	....

(1) Struthers Iron & Steel Co., Struthers, Ohio, charges 50¢ per ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base price for low phosphorous $37.50 per gross ton, f.o.b. Lyles, Tenn. Delivered to Chicago, $42.99. High phosphorous charcoal pig iron is not being produced.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); phosphorus differentials, a reduction of 38¢ per ton for phosphorus content of 0.70 pct and over; manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson Ohio—$36.00; f.o.b. Buffalo—$37.25. Add $1.00 per ton for each additional 0.50 pct Si. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

YOUR steel requirements can best be served by a progressive, superbly staffed, completely integrated steel producer. WISCONSIN is exactly that.

Progressive is more than a word at WISCONSIN. It's a *fact* that has been demonstrated by our development of Sulfite-Treated Steel—the highly machinable steel that overcomes the faults of resulphurized steels. "H" steels of guaranteed hardenability are a specialty of ours. Both of these steels are earning wide acceptance and acclaim.

Superbly Staffed by top-flight steelmen, WISCONSIN has one prime objective: to make the best possible steel for our customers. Every man in the mill works toward that goal.

An Integrated Organization gives WISCONSIN complete control of the product from the ore mines to the customer. That control means finer steel.

Watch WISCONSIN for steel progress. We can't supply all the steel our customers need but the picture is improving. We haven't compromised with quality. Our sales and metallurgical staffs are ready to serve you.

WISCONSIN STEEL OPERATIONS

Ore Mines • Coal Mines • Ore Freighters
Blast Furnaces • Open Hearth Furnaces • Rolling Mills
Heat-Treating, Cold Finishing and Annealing Facilities

WISCONSIN STEEL COMPANY

(Affiliate of International Harvester Company)

180 North Michigan Avenue **Chicago 1, Illinois**

WISCONSIN STEEL

Ferromanganese

78-82% Mn, maximum contract base price, gross ton, lump size, f.o.b. Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Less ton lots (packed)	148.50
F.o.b. Pittsburgh	139.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Briquets—cents per pound of briquet, freight allowed, 66% contained Mn.

	Eastern	Central	Western
Carload, bulk	6.05	6.30	6.60
Ton lots	6.65	7.55	8.55
Less ton lots	6.80	7.80	8.80

Spiegeleisen

Contract prices, gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$39.00	$40.00
F.o.b. Pittsburgh, Chicago	44.00	

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, f.o.b. shipping point, freight allowed, eastern zone.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	30
L.c.l. lots	32

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	32
Ton lots	34
Less ton lots	36

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, f.o.b. shipping point, freight allowed, eastern zone.

	Carloads	Ton	Less
0.10% max. C, 0.06% P, 90% Mn	21.00	21.40	21.65
0.10% max. C	20.50	20.90	21.15
0.15% max. C	20.00	20.40	20.65
0.30% max. C	19.50	19.90	20.15
0.50% max. C	19.00	19.40	19.65
0.75% max. C, 7.00% max. Si	16.00	16.40	16.65

Silicomanganese

Contract basis, lump size, cents per pound of metal, f.o.b. shipping point, freight allowed. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05
Ton lots	6.70
Briquet, contract basis, carlots, bulk freight allowed, per lb of briquet	5.80
Ton lots	6.30
Less ton lots	6.55

Silvery Iron (electric furnace)

Si 14.01 to 14.50%, $53.25 f.o.b. Keokuk, Iowa; $50.00 f.o.b. Jackson, Ohio; $51.25 f.o.b. Niagara Falls. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, f.o.b. shipping point, freight allowed, for ton lots packed.

	Eastern	Central	Western
96% Si, 2% Fe	13.10	13.55	16.50
97% Si, 1% Fe	13.45	13.90	16.80

Ferrosilicon Briquets

Contract price, cents per pound of briquet, bulk, f.o.b. shipping point, freight allowed to destination, 40% Si.

	Eastern	Central	Western
Carload, bulk	3.60	3.75	3.90
Ton lots	4.15	4.55	4.60
Less ton lots	4.40	4.80	4.85

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
50% Si	7.05	7.50	7.65
75% Si	8.55	8.70	9.25
80-90% Si	9.50	9.65	10.15
90-95% Si	11.80	11.95	12.40

Ferrochrome (65-72% *Cr, 2% max. Si*)

Contract prices, cents per pound, contained Cr, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
0.06% C	23.00	23.40	24.00
0.10% C	22.50	22.90	23.50
0.15% C	22.00	22.40	23.00
0.20% C	21.50	21.90	22.50
0.50% C	21.00	21.40	22.00
1.00% C	20.50	20.90	21.50
2.00% C	19.50	19.90	20.50
65-69% Cr, 4-10% C	14.50	14.90	15.00
62-66% Cr, 5-7% C	15.05	15.45	15.55

Briquets—contract price, cents per pound of briquet, f.o.b. shipping point, freight allowed, 60% chromium.

	Eastern	Central	Western
Carload, bulk	9.20	9.50	9.90
Ton lots	9.80	10.30	11.80
Less ton lots	10.10	10.60	12.10

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2¢ per lb to regular low carbon ferrochrome price schedule. Add 2¢ for each additional 0.25% N. High carbon type: 66.71% Cr, 4.5% C, 0.75% N. Add 5¢ per lb to regular high carbon ferrochrome price schedule.

S. M. Ferrochrome

Contract price, cents per pound chromium contained, lump size, f.o.b. shipping point, freight allowed.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

	Eastern	Central	Western
Carload	15.60	16.00	16.10
Ton lots	16.65	17.30	18.50
Less ton lots	17.30	17.95	19.15

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

	Eastern	Central	Western
Carload	20.00	20.40	21.00
Ton lots	21.00	21.65	22.85
Less ton lots	22.00	22.65	23.85

Chromium Metal

Contract prices, cents per lb, chromium contained, carload, f.o.b. shipping point, freight allowed. 97% min. Cr, 1% max. Fe.

	Eastern	Central	Western
0.20% max. C	83.50	85.00	86.25
0.50% max. C	79.50	81.00	82.25
9.00% min. C	79.50	81.00	82.25

Chromium—Copper

Contract price, cents per pound of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si.

Shot or ingot	45¢

Calcium—Silicon

Contract price per lb of alloy, lump, f.o.b. shipping point, freight allowed.

30-35% Ca, 60-65% Si, 3.00% max. Fe or 28-32% Ca, 60-65% Si, 6.00% max. Fe.

	Eastern	Central	Western
Carloads	13.00	13.50	15.55
Ton lots	14.50	15.25	17.40
Less ton lots	15.50	16.25	18.40

Calcium—Manganese—Silicon

Contract prices, cents per lb of alloy, lump, f.o.b. shipping point, freight allowed.

16-20% Ca, 14-18% Mn, 53-59% Si.

	Eastern	Central	Western
Carloads	15.50	16.00	18.05
Ton lots	16.50	17.35	19.10
Less ton lots	17.00	17.85	19.60

Calcium Metal

Eastern zone contract prices, cents per pound of metal, f.o.b. shipping point, freight allowed. Add 1¢ for central zone; 5¢ for western zone.

	Cast	Turnings	Distilled
Ton lots	$1.35	$1.75	$4.25
Less ton lots	1.60	2.00	5.00

CMSZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

	Eastern	Central	Western
Ton lots	12.00	12.75	14.75
Less ton lots	12.50	13.25	15.25

Alloy 5: 50-56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

Ton lots	11.75	12.50	14.50
Less ton lots	12.25	13.00	15.00

SMZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe.

	Eastern	Central	Western
Ton lots	12.00	12.85	14.60
Less ton lots	12.50	13.35	15.10

Other Ferroalloys

Ferrotungsten, standard, lump or ¼X down, packed, f.o.b. plant Niagara Falls, Washington, Pa., York, Pa., per pound contained T, 5 ton lots, freight allowed	$1.88
Ferrovanadium, 35-55%, contract basis, f.o.b. plant, freight allowances, per pound contained V.	
Openhearth	$2.70
Crucible	$2.80
High speed steel (Primos)	$2.90
Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, per pound contained V_2O_5	$1.10
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant, freight allowed, per pound contained Cb.	
Ton lots	$2.25
Less ton lots	$2.30
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo	95¢
Calcium molybdate, 40-45%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo	80¢
Molybdenum oxide briquets, 48-52% Mo, f.o.b. Langeloth, Pa., per pound contained Mo	80¢
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per pound contained Mo	80¢
Ferrotitanium, 40-45%, 0.10%C max., f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti	$1.23
Less ton lots	$1.25
Ferrotitanium, 20-25%, 0.10%C max., ton lots, per pound contained Ti	$1.35
Less ton lots	$1.40
High carbon ferrotitanium, 15-20%, 6-8% C, contract basis, f.o.b. Niagara Falls, freight allowed, carloads, per net ton	$142.50
Ferrophosphorus, 18%, electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, Electrolytic, 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.	
Carload lots	14¢
Zirconium, 12-15%, contract basis, lump, f.o.b. plant, freight allowed, per pound of alloy	
Carload, bulk	4.60¢
Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Niagara Falls, carload	6.25¢
Ton lots	6.75¢
Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound	
Car lots	8.50¢
Ton lots	9.25¢
Less ton lots	9.75¢

Boron Agents

Contract prices per pound of alloy, f.o.b. shipping point, freight allowed. Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern	Central	Western
Less ton lots	$1.30	$1.3075	$1.329

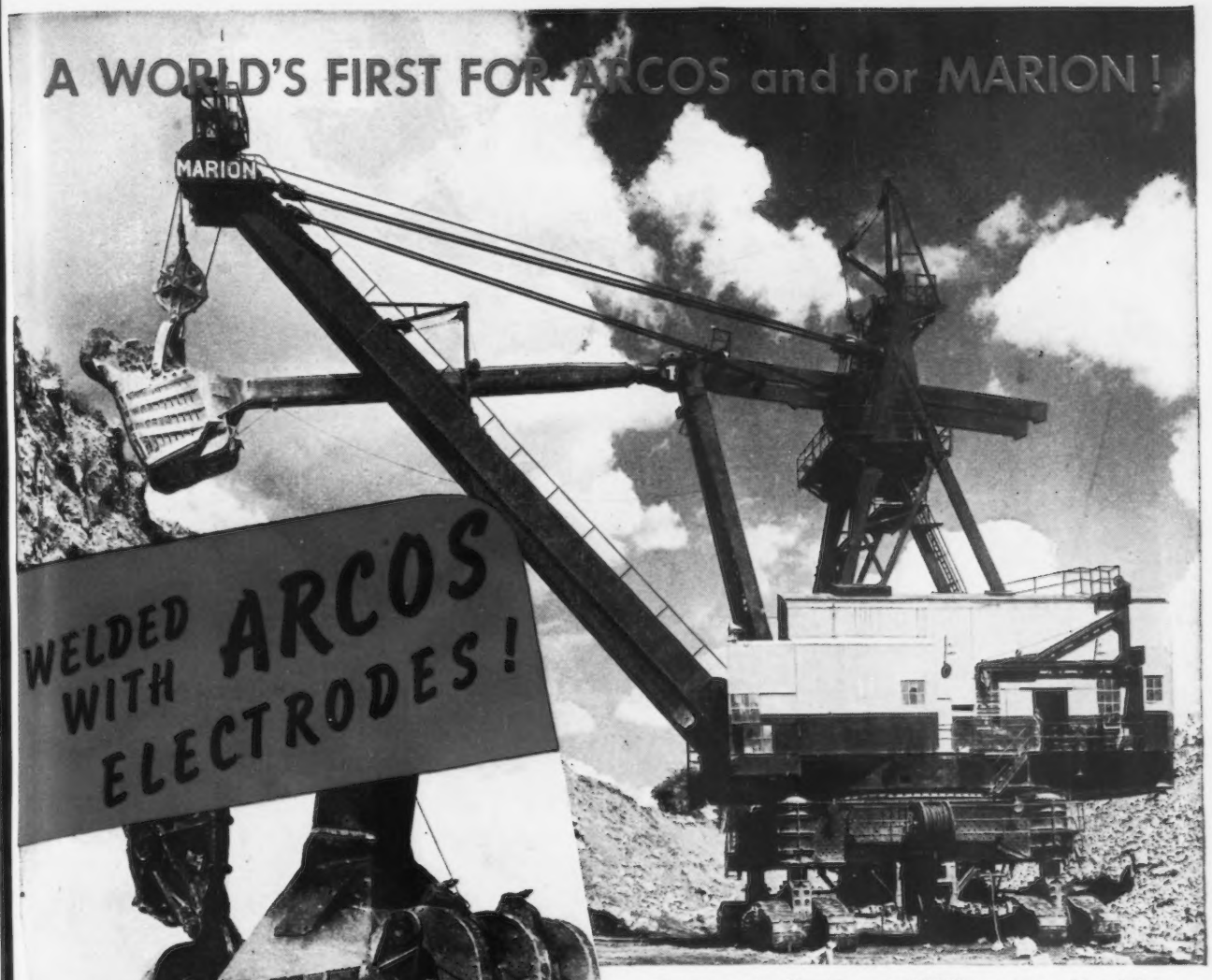
Manganese—Boron 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

Ton lots	$1.89	$1.903	$1.935
Less ton lots	2.01	2.023	2.055

Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

Less ton lots	$2.10	$2.1125	$2.1445

Silcaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy.	
Carload lots	25¢
Ton lots	26¢
Silvaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy.	
Carload lots	58¢
Ton lots	59¢
Grainal, f.o.b. Bridgeville, Pa., freight allowed, 50 lb and over.	
No. 1	87.5¢
No. 6	60¢
No. 79	45¢
Bortram, f.o.b. Niagara Falls	
Ton lots, per pound	45¢
Less ton lots, per pound	50¢



Dipper capacity, 40 cubic yards. 35,000 pounds saved by ability to weld low alloy high tensile steels.

TO WELD THIS DIPPER required

3,000 pounds of Arcos Chromend 29/9 (Type 312) electrodes (this was 95% of this grade used)

1,300 pounds of Arcos Manganend 2M electrodes (this was 100% of this grade used)

Chromend 29/9—for welding wear resisting, high manganese steel to itself or to low alloy high tensile steels

Manganend 2M—for welding low alloy high tensile steels

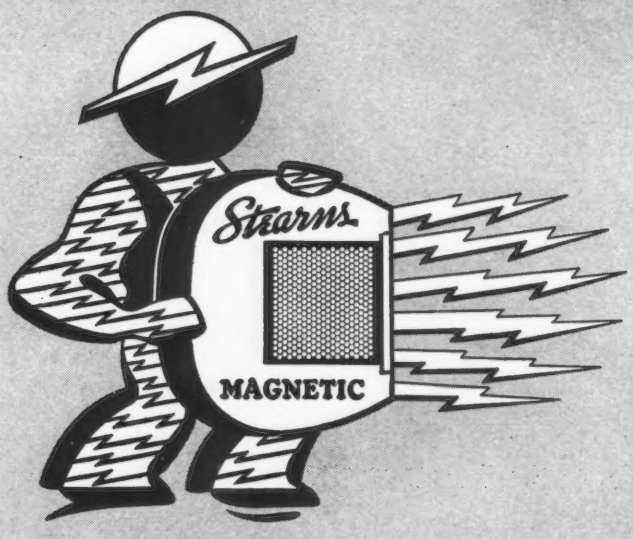
IT MEANT LIVING WITH THE JOB

For fifteen months the Research and Field Engineering facilities of Arcos worked diligently with Marion to weld this "first of its kind" alloy job. Electrode recommendations made by Arcos were followed; the techniques of welding developed by Arcos were employed—

Arcos shares with Marion their pride in this accomplishment. Arcos is again "showing the way".

ARCOS

ARCOS CORPORATION • 304 GULF BUILDING, PHILA. 2, PA.



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I stand for the highest type of magnetic engineering.

I harness the forces of magnetism to help you reduce production costs.

I represent close to fifty years of pioneering experience in the development of magnetic separation methods, magnetic pulleys and drums, lifting and suspended separation magnets, clutches, brakes and similar equipment.

My engineering and laboratory facilities are available for consultation and advice on the most profitable and practical application of Stearns Magnetic machinery to your problem.

Whether you need protection for your product, machinery or employees against the hazards of tramp iron . . . concentrations of ores and minerals for improved values . . . reclamation of metals . . . purifications . . . moving material, my equipment will give you the most for your dollar value.

My products operate in all types of industries with definitely profitable results.

I may be able to help you. Consult Stearns Magnetic sales engineers.

Stearns
MAGNETIC MFG. CO.
MILWAUKEE 4, WISCONSIN

Prices and Production

(CONTINUED FROM PAGE 178)

Merchant Bars at Pittsburgh

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	1.90	1.50	1.60	1.75	1.80	1.85
February	1.90	1.50	1.60	1.75	1.80	1.85
March	1.90	1.52	1.60	1.75	1.80	1.85
April	1.95	1.60	1.60	1.79	1.80	1.85
May	1.95	1.60	1.60	1.90	1.80	1.85
June	1.95	1.60	1.60	1.90	1.80	1.85
July	1.95	1.60	1.60	1.82	1.80	1.95
August	1.95	1.60	1.60	1.80	1.80	1.95
September	1.94	1.60	1.60	1.80	1.80	1.95
October	1.90	1.60	1.75	1.80	1.85	2.07
November	1.90	1.60	1.75	1.80	1.85	2.05
December	1.90	1.60	1.75	1.80	1.85	2.03
Average	1.92	1.57	1.64	1.81	1.81	1.95

	1937	1938	1939		1945	1946
January	2.20	2.45	2.25		2.15	2.25
February	2.20	2.45	2.25		2.15	2.38
March	2.40	2.45	2.25	1944	2.15	2.50
April	2.45	2.45	2.25	1943	2.15	2.50
May	2.45	2.45	2.19	1942	2.17	2.50
June	2.45	2.41	2.15	1941	2.25	2.50
July	2.45	2.25	2.15	1940 price fixed	2.25	2.50
August	2.45	2.25	2.15	at	2.25	2.50
September	2.45	2.25	2.15	at	2.25	2.50
October	2.45	2.25	2.15	2.15	2.25	2.50
November	2.45	2.25	2.15		2.25	2.50
December	2.45	2.25	2.15		2.25	2.56
Average	2.40	2.35	2.19		2.21	2.43

Cold-Finished Steel Bars at Pittsburgh

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	1.90	2.00	1.70	2.10	2.10	2.10
February	1.90	2.00	1.70	2.10	2.10	2.10
March	1.90	2.00	1.70	2.10	2.10	2.10
April	1.95	2.00	1.70	2.10	2.01	2.10
May	1.95	1.82	1.70	2.10	1.95	2.10
June	1.95	1.70	1.70	2.10	1.95	2.10
July	1.95	1.70	1.70	2.10	1.95	2.25
August	1.95	1.70	1.70	2.10	1.95	2.25
September	1.94	1.70	1.95	2.10	1.95	2.25
October	1.90	1.70	1.95	2.10	1.95	2.35
November	1.90	1.70	1.95	2.10	1.95	2.35
December	1.90	1.70	2.10	2.10	1.95	2.35
Average	1.92	1.81	1.80	2.10	1.99	2.20

	1937	1938	1939		1945	1946
January	2.55	2.90	2.70		2.65	2.75
February	2.55	2.90	2.70		2.65	2.93
March	2.83	2.90	2.70	1944	2.65	3.10
April	2.90	2.90	2.70	1943	2.65	3.10
May	2.90	2.90	2.68	1942	2.65	3.10
June	2.90	2.70	2.65	1941	2.65	3.10
July	2.90	2.70	2.65	1940 price fixed	2.65	3.10
August	2.90	2.70	2.65	at	2.73	3.10
September	2.90	2.70	2.65	at	2.75	3.10
October	2.90	2.70	2.65	2.65	2.75	3.10
November	2.90	2.70	2.65		2.75	3.10
December	2.90	2.70	2.65		2.75	3.10
Average	2.84	2.78	2.67		2.69	3.06

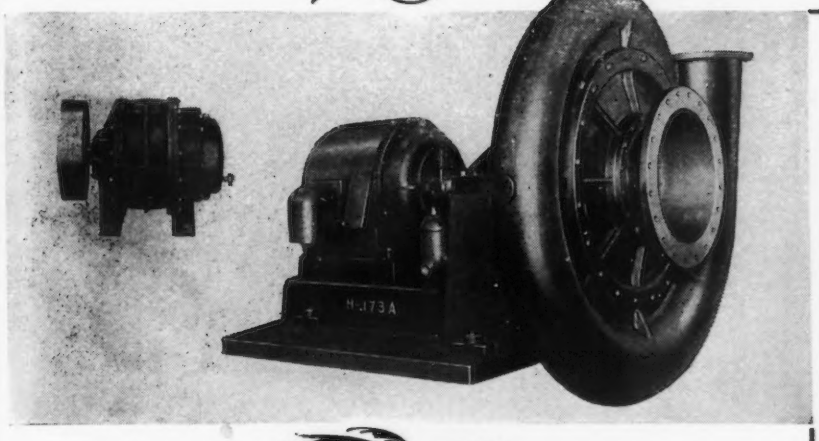
Plates at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	1.90	1.64	1.50	1.60	1.70	1.80
February	1.90	1.65	1.50	1.60	1.70	1.80
March	1.90	1.65	1.52	1.60	1.70	1.80
April	1.95	1.65	1.60	1.55	1.74	1.80
May	1.95	1.65	1.60	1.50	1.85	1.80
June	1.95	1.65	1.60	1.53	1.85	1.80
July	1.95	1.63	1.60	1.60	1.81	1.80
August	1.95	1.60	1.60	1.60	1.80	1.80
September	1.95	1.60	1.60	1.60	1.80	1.80
October	1.94	1.60	1.60	1.70	1.80	1.80
November	1.90	1.60	1.60	1.70	1.80	1.80
December	1.90	1.54	1.60	1.70	1.80	1.80
Average	1.93	1.62	1.57	1.61	1.78	1.80

	1936	1937	1938		1945	1946
January	1.80	2.05	2.25		2.10	2.25
February	1.80	2.05	2.25	1944	2.10	2.38
March	1.80	2.21	2.25	1943	2.20	2.50
April	1.80	2.25	2.25	1942	2.20	2.50
May	1.80	2.25	2.25	1941	2.21	2.50
June	1.80	2.25	2.22	1940	2.25	2.50
July	1.90	2.25	2.10	1939 price fixed	2.25	2.50
August	1.90	2.25	2.10	at	2.25	2.50
September	1.90	2.25	2.10	at	2.25	2.50
October	1.90	2.25	2.10	2.10	2.25	2.50
November	1.90	2.25	2.10		2.25	2.50
December	1.90	2.25	2.10		2.25	2.50
Average	1.85	2.21	2.17		2.21	2.47

A THIMBLE OF AIR..



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From our wide range of sizes and capacities, you can select a Roots-Connersville Blower to deliver nearly any quantity of air for practically any industrial process.

For instance, our Rotary Positive units are widely used in separate or built-in applications where a small amount of air is required. For large volumes, you have the choice between Rotary Positive and Centrifugal Blowers, depending upon your specific requirements.

R-C *dual-ability* to supply either Rotary or Centrifugal Blowers offers important advantages to users. Because we design and build both types, we can be completely unprejudiced in our recommendations. This *dual-ability* frequently results in substantial savings in first cost and operating and maintenance expense.

Whatever your requirements may be, whether to move air or gas, ask R-C *dual-ability* for the answer. You'll be sure of the right unit to suit your needs, for long years of profitable performance.

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701 Ohio Avenue, Connersville, Indiana

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BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

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IF YOU MOVE AIR, GAS OR LIQUIDS IN YOUR BUSINESS, CALL ON *R-C dual-ability!*

These samples of work done by R-C Rotary Positive or Centrifugal units may suggest ways in which you can increase or improve production, or cut costs. Send for details on coupon below or write us about your problems.

Metal working: Air for cupolas, blast furnaces and other combustion processes; gas exhausters; air for drying ovens and annealing processes; gas exhausters and boosters.

Chemical processes: Blowers or exhausters for supplying or removing gas or air; for filtering, aeration or agitation of liquids; meters for measuring gas or liquids.

Mining: Air for ventilation; rock dust removal during drilling; flotation processes; smelters; coal treatment and washing.

Paper making: Vacuum pumps for suction rolls, flat boxes and felt conditioners; filter pumps; gas exhausters and boosters, pneumatic conveying.

Food production: Blowers for pneumatic conveying; gas boosters; heat processing, removal of waste or by-products.

MAIL THIS COUPON WITH YOUR LETTERHEAD

Roots-Connersville Blower Corporation,
701 Ohio Avenue,
Connersville, Indiana.
Please send more information on:

BLOWERS_____ EXHAUSTERS_____
VACUUM PUMPS_____ METERS_____
BOOSTERS_____ INERT GAS GENERATORS_____

NAME_____

TITLE_____

DANLY PRESSES

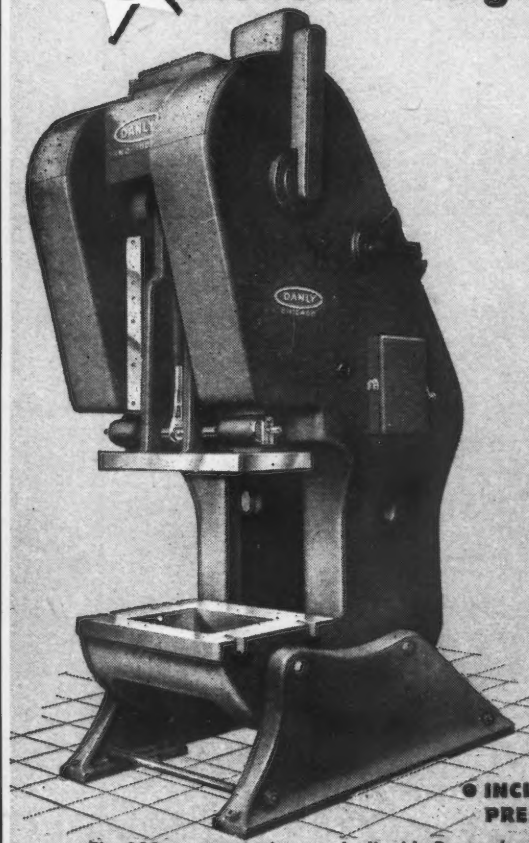
1 Rugged Construction

2 Mechanical Accuracy

3 Pressure Lubrication

4 Air-Friction Clutch

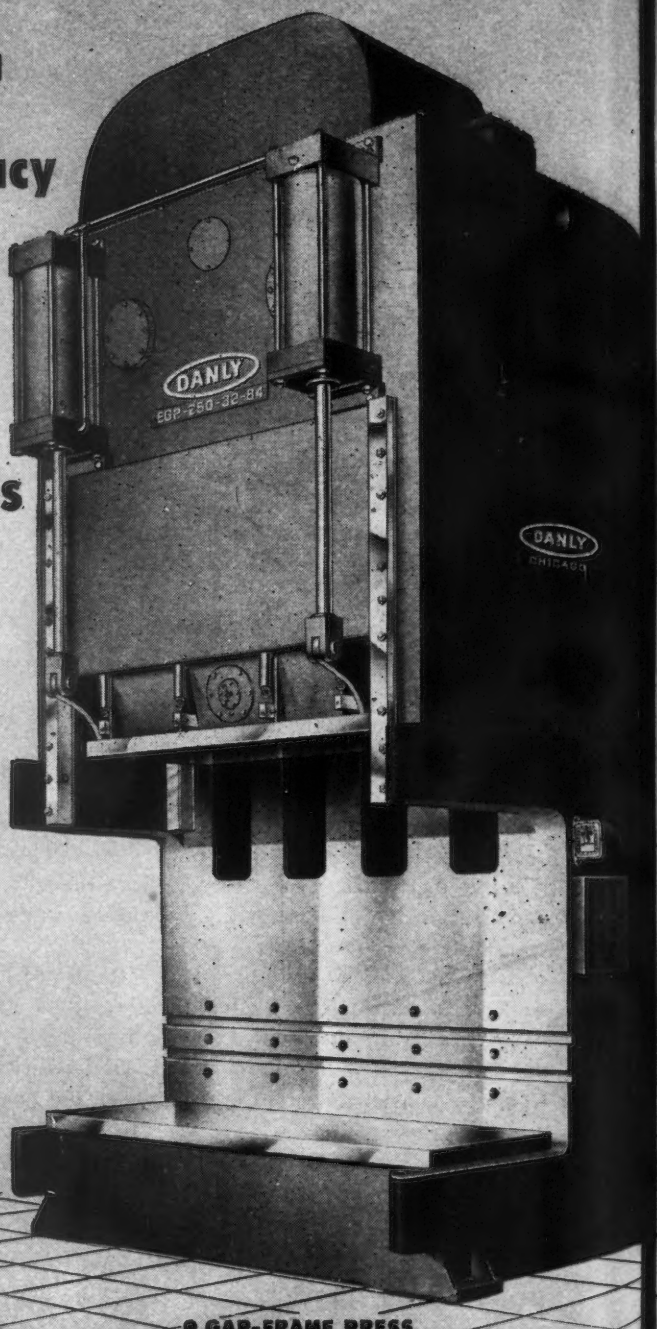
5 Modern Design Features



● INCLINABLE PRESS

The 100-ton, eccentric gear, Inclinable Press, *shown left*, has a unit frame—one piece cast steel or Danlyweld as specified, and an all-steel Danlyweld base. Extra long gibs and two suspension points—insure even pressure along the full length of the stroke, make for accurate alignment on large or progressive dies.

This press has an 8" stroke—operates 40 strokes per minute. Adjustment of slide—4" by hand. Bed area is 31" x 40"—designed to be equipped with air cushion if desired. Pivot point is so arranged that the center of the bed is not elevated when press is inclined. Distance floor to bed—33". Shut Height—19".



● GAP-FRAME PRESS

The 250-ton, 2-Point Eccentric Gear Gap-Frame Press, *shown above* is of all steel Danlyweld construction. Intermediate *continuous* structural members extend up through the back of the frame reducing deflection throughout the entire length of the bed. Gearing and driving members are completely enclosed within the frame.

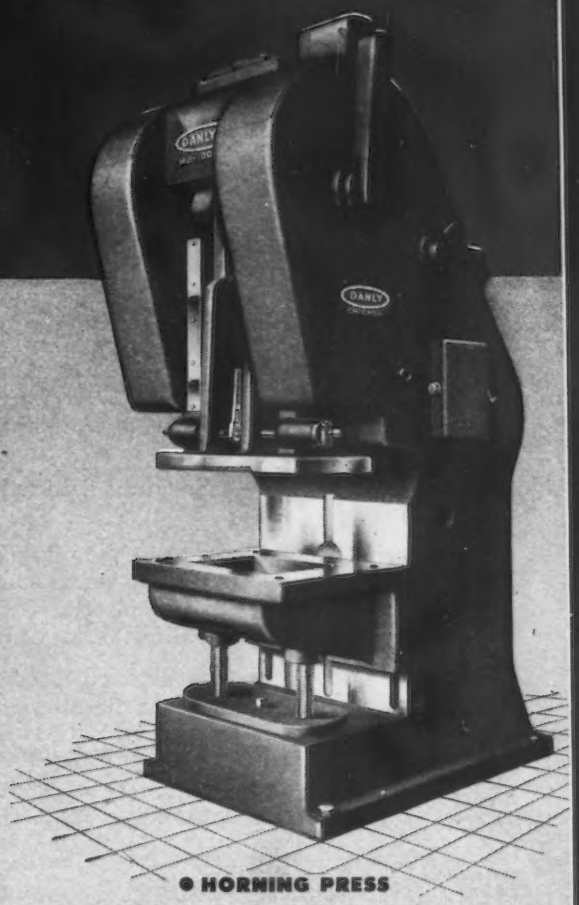
This press has a 14" stroke—operates at 20 strokes per minute. Bed area is 32" x 84". Shut height—54".

..THE PRESS for MODERN PRODUCTION..

● 4-POINT STRAIGHT-SIDE PRESS

Compact, enclosed construction keynotes the design of the 300-ton Straight-Side Press, shown above. Gears and driving members are completely enclosed within the frame.

This press has eccentrics cut on the four main gears and 4 Suspension Points—Extra Long Gibs. Bed area is 58" x 96". Stroke is 18"—Double geared to operate at 18 strokes per minute. Adjustments of Slide—12". Shut height—54". Air-Friction Clutch, Electric Stroke Indicator, and Push-Button Control—Motor Adjustment of Slide, are standard equipment on this model.



● HORNING PRESS

The 100-ton Eccentric Gear, Horning Press, shown above, has a one-piece cast-steel frame. Extra-long gibs and 2 suspension points—unusual features in a press of this type and size, make for accurate alignment on large or progressive dies.

This press has an 8" stroke—operates at 40 strokes per minute. Adjustment of slide—4", by hand. Shut height with knee adjustment down, slide adjustment up—20"; adjustment of knee—10". Shut height with knee removed—39".

DANLY
MACHINE SPECIALTIES
INC.

●

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CHICAGO 50, ILLINOIS

SHORT OF CADMIUM?

TRY Luster-on* on zinc

No question about it—cadmium is hard to get! But *Luster-on* on zinc may be your answer!*

Luster-on* produces attractive brilliance and passivity on zinc—giving a bright surface which resists stains, fingermarks and white corrosion. It gives to zinc plate an aging resistance, appearance and protection equal or superior to cadmium plate at a lower cost.

Luster-on* does not impair electrical conductivity or interfere with spot welding, and provides an adhesive base for lacquers and cements.

Successful Luster-on applications include:*

Ventilation Equipment	Radio Parts
Fastening Devices	Electrical Fittings
Machine Parts	Builders' Hardware
Hand Tools	Automotive Parts
Sporting Goods	Nuts and Bolts
Refrigerator Shelves	Toys

Send the coupon and a sample part for processing today! See the results for yourself. No obligation.

*Patent applied for

THE Chemical CORPORATION
54 Waltham Ave., Springfield 9, Mass.

15

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name_____

Address_____

Strip Nickel faster and better with .. STRIPODE!

Speed-up the action of your regular sulphuric acid strip bath by adding Stripode. Salvage plating racks in less time with less acid. Stripode helps protect the base metal from pitting and roughening. Send for free sample. Start savings right away!

THE CHEMICAL CORPORATION
54 Waltham Avenue, Springfield 9, Mass.
Please send me full information and free sample of STRIPODE for better nickel stripping.

Name.....

Address.....

15-S

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Massachusetts

Hot-Rolled Sheets at Pittsburgh

(cents per pound)

	1929	1933	1934	1935	1936	1937
January	2.10	1.62	1.75	1.85	1.85	2.15
February	2.10	1.60	1.75	1.85	1.85	2.15
March	2.10	1.55	1.75	1.85	1.85	2.35
April	2.10	1.55	1.81	1.85	1.85	2.40
May	2.13	1.44	2.00	1.85	1.85	2.40
June	2.20	1.50	2.00	1.85	1.87	2.40
July	2.14	1.65	1.88	1.85	1.95	2.40
August	2.10	1.65	1.85	1.85	1.95	2.40
September	2.10	1.68	1.85	1.85	1.95	2.40
October	2.10	1.75	1.85	1.85	1.95	2.40
November	2.10	1.75	1.85	1.85	1.95	2.40
December	2.18	1.75	1.85	1.85	2.15	2.40
Average	2.12	1.62	1.85	1.85	1.92	2.35

	1938	1939	1940		1945	1946
January	2.40	2.15	2.10		2.10	2.20
February	2.40	2.15	2.10		2.10	2.31
March	2.40	2.15	2.10	1944	2.18	2.425
April	2.40	2.15	2.10	1943	2.20	2.425
May	2.38	2.06	1.98	1942	2.20	2.425
June	2.27	2.00	2.10	1941	2.20	2.425
July	2.15	2.00	2.10	price fixed at	2.20	2.425
August	2.15	2.00	2.10	2.10	2.20	2.425
September	2.15	2.00	2.10		2.20	2.425
October	2.03	2.00	2.10		2.20	2.425
November	2.15	2.02	2.10		2.20	2.425
December	2.15	2.10	2.10		2.20	2.485
Average	2.25	2.06	2.09		2.18	2.40

Cold-Rolled Sheets at Pittsburgh

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	4.10	2.90	2.35	2.75	2.95	2.95
February	4.10	2.80	2.25	2.75	2.95	2.95
March	4.10	2.86	2.30	2.75	2.95	2.95
April	4.10	2.90	2.30	2.85	2.95	2.95
May	4.10	2.89	2.34	3.15	2.95	2.95
June	4.10	2.85	2.29	3.15	2.95	2.95
July	4.10	2.85	2.40	2.99	2.95	3.05
August	4.08	2.81	2.47	2.95	2.95	3.05
September	4.00	2.75	2.75	2.95	2.95	3.05
October	4.00	2.65	2.75	2.95	2.95	3.05
November	4.00	2.63	2.75	2.95	2.95	3.05
December	3.98	2.65	2.75	2.95	2.95	3.25
Average	4.06	2.80	2.48	2.96	2.95	3.02

	1937	1938	1939	1940		1946
January	3.25	3.55	3.20	3.05		3.05
February	3.25	3.50	3.20	3.05		3.16
March	3.49	3.45	3.20	3.05	1945	3.275
April	3.55	3.45	3.20	2.93	1944	3.275
May	3.55	3.43	3.11	3.05	1943	3.275
June	3.55	3.32	3.05	3.05	1942	3.275
July	3.55	3.20	3.05	3.05	1941 price fixed at	3.275
August	3.55	3.20	3.05	3.05	3.05	3.275
September	3.55	3.20	3.05	3.05		3.275
October	3.55	3.08	3.05	3.05		3.275
November	3.55	3.20	3.05	3.05		3.275
December	3.55	3.20	3.05	3.05		3.215
Average	3.49	3.31	3.10	3.04		3.242

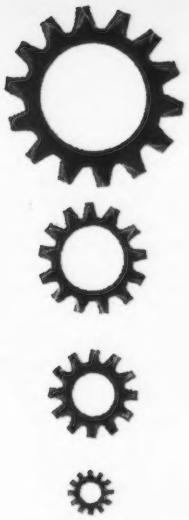
No. 24 Gage Galvanized Sheets at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	3.60	2.90	2.80	2.68	2.85	3.10
February	3.60	2.90	2.75	2.50	2.85	3.10
March	3.60	2.90	2.85	2.60	2.85	3.10
April	3.60	2.84	2.85	2.63	2.95	3.10
May	3.60	2.80	2.85	2.70	3.25	3.10
June	3.60	2.74	2.85	2.70	3.25	3.10
July	3.60	2.90	2.85	2.85	3.13	3.10
August	3.50	2.90	2.81	2.85	3.10	3.10
September	3.50	2.90	2.75	2.85	3.10	3.10
October	3.50	2.90	2.85	2.85	3.10	3.10
November	3.48	2.90	2.85	2.85	3.10	3.10
December	3.40	2.86	2.85	2.85	3.10	3.10
Average	3.55	2.87	2.83	2.74	3.05	3.10

	1936	1937	1938		1945	1946
January	3.10	3.40	3.80		3.50	3.70
February	3.10	3.40	3.80	1944	3.50	3.88
March	3.10	3.72	3.80	1943	3.62	4.05
April	3.10	3.80	3.80	1942	3.65	4.05
May	3.10	3.80	3.80	1941	3.66	4.05
June	3.10	3.80	3.68	1940	3.70	4.05
July	3.20	3.80	3.50	1939 price fixed at	3.70	4.05
August	3.20	3.80	3.50	3.50	3.70	4.05
September	3.20	3.80	3.50		3.70	4.05
October	3.20	3.80	3.45		3.70	4.05
November	3.20	3.80	3.50		3.70	4.05
December	3.40	3.80	3.50		3.70	*3.65
Average	3.17	3.73	3.64		3.65	3.99

* Based on 10 gage in December.

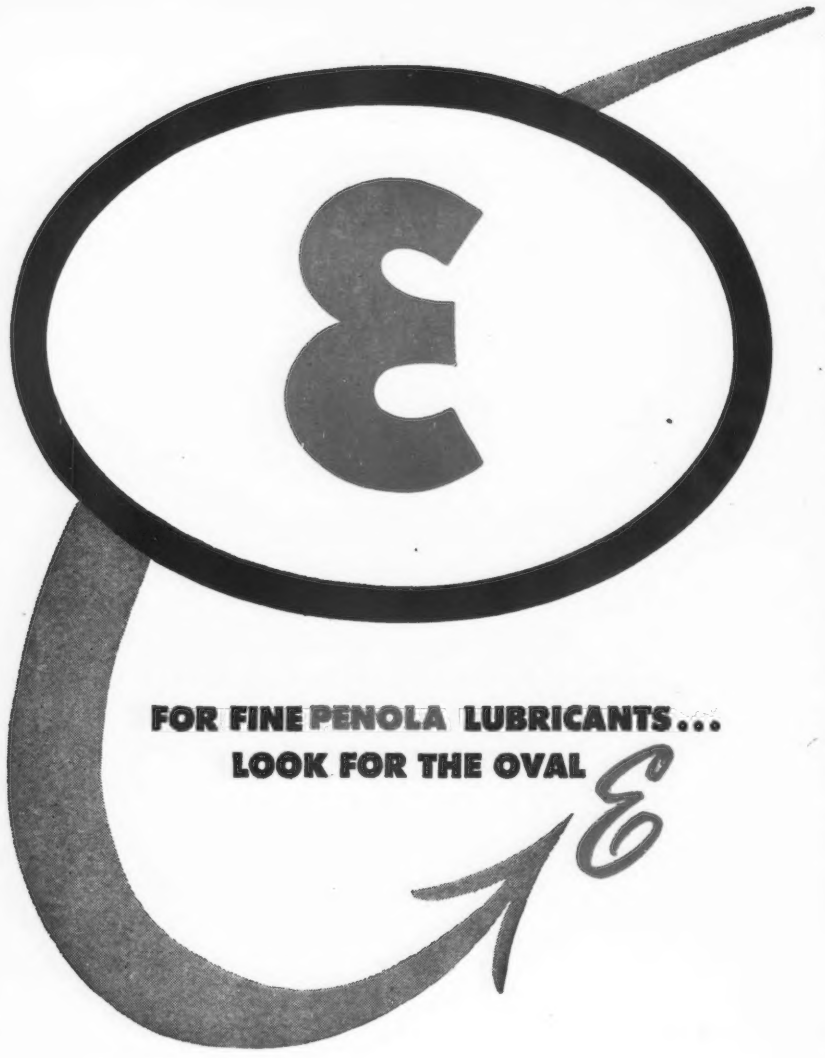


vibration protection with *teeth* in it!

There's no locking principle that can match the tapered-twisted teeth of the Shakeproof Lock Washer for positive protection against the loosening action of vibration. Whether you're using a large size to anchor a motor block or a small size to assemble a delicate instrument you'll find that Shakeproof's exclusive teeth bite into both surfaces and set up a strut-action lock that prevents the screw or nut from working loose. Vibration protection like this is the result of constant research . . . the kind of research that has produced Shakeproof's newest lock washer which is available now in some of the smaller sizes. This new lock washer has a greater number of teeth which provide an increased tooth area for still better locking. With more metal at the rim, resistance to flattening is increased and breakage is virtually eliminated. In short, it's our famous tapered-twisted principle applied in such a way that you get more teeth, more locking edges.

SHAKEPROOF
LOCK WASHERS

SHAKEPROOF, INC.
Division of Illinois Tool Works
2501 North Keeler Avenue, Chicago 39, Illinois
2895 E. GRAND BLVD., DETROIT 2, MICH.
OFFICES IN OTHER PRINCIPAL CITIES
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario



This trademark stands for high quality industrial lubricants, *designed to serve efficiently.* Penola Lubricants are aimed at eliminating production losses caused by faulty lubrication. Their first job is the protection of your profits . . . by helping to protect your equipment and the quality of your finished product. Depend on Penola Lubricants for better lubrication.

PENOLA LUBRICANTS

CHICAGO, ILL. • DETROIT • NEW YORK • ST. LOUIS

PENOLA PRODUCTS HAVE MEANT EXTRA PROTECTION SINCE 1885

Tinplate at Pittsburgh

(per base box)

	1928	1929	1930	1931	1932	1933
January	$5.25	$5.35	$5.25	$5.00	$4.75	$4.25
February	5.25	5.35	5.25	5.00	4.75	4.25
March	5.25	5.35	5.25	5.00	4.75	4.25
April	5.25	5.35	5.25	5.00	4.75	4.25
May	5.25	5.35	5.25	5.00	4.75	4.25
June	5.25	5.35	5.25	5.00	4.75	4.25
July	5.25	5.35	5.25	5.00	4.75	4.25
August	5.25	5.35	5.25	5.00	4.75	4.25
September	5.25	5.35	5.25	5.00	4.75	4.65
October	5.25	5.35	5.00	4.75	4.75	4.65
November	5.25	5.35	5.00	4.75	4.55	4.65
December	5.25	5.35	5.00	4.75	4.25	5.25
Average	5.25	5.35	5.19	4.94	4.69	4.43

	1934	1935	1936	1937	1938	
January	$5.25	$5.25	$5.25	$4.85	$5.35	1946
February	5.25	5.25	5.25	4.85	5.35	1945
March	5.25	5.25	5.25	4.85	5.35	1944
April	5.25	5.25	5.25	5.35	5.35	1943
May	5.25	5.25	5.25	5.35	5.35	1942
June	5.25	5.25	5.25	5.35	5.35	1941
July	5.25	5.25	5.25	5.35	5.35	1940
August	5.25	5.25	5.25	5.35	5.35	1939
September	5.25	5.25	5.25	5.35	5.35	price
October	5.25	5.25	5.25	5.35	5.35	fixed
November	5.25	5.25	5.25	5.35	5.18	at
December	5.25	5.25	5.25	5.35	5.00	$5.00
Average	5.25	5.25	5.25	5.22	5.31	

Hot-Rolled Strip at Pittsburgh

(cents per pound)

	1929	1932	1933	1934	1935	1936
January	1.80	1.41	1.45	1.75	1.85	1.85
February	1.80	1.40	1.45	1.75	1.85	1.85
March	1.80	1.40	1.45	1.75	1.85	1.85
April	1.90	1.40	1.45	1.81	1.85	1.85
May	1.90	1.40	1.49	2.00	1.85	1.85
June	1.90	1.41	1.55	2.00	1.85	1.85
July	1.90	1.45	1.60	1.88	1.85	1.98
August	1.90	1.45	1.64	1.85	1.85	1.98
September	1.97	1.45	1.68	1.85	1.85	1.98
October	1.90	1.45	1.75	1.85	1.85	1.98
November	1.90	1.45	1.75	1.85	1.85	1.98
December	1.90	1.45	1.75	1.85	1.85	2.11
Average	1.88	1.43	1.58	1.85	1.85	1.91

	1937	1938	1939	1940		1946
January	2.15	2.40	2.15	2.10		2.10
February	2.15	2.40	2.15	2.10		*2.23
March	2.35	2.40	2.15	2.10	1945	2.35
April	2.40	2.40	2.15	1.98	1944	2.35
May	2.40	2.38	2.06	2.10	1943	2.35
June	2.40	2.27	2.00	2.10	1942	2.35
July	2.40	2.15	2.00	2.10	1941 price	2.35
August	2.40	2.15	2.00	2.10	fixed	2.35
September	2.40	2.15	2.00	2.10	at	2.35
October	2.40	2.03	2.00	2.10	2.10	2.35
November	2.40	2.15	2.02	2.10		2.35
December	2.40	2.15	2.10	2.10		2.47
Average	2.35	2.25	2.06	2.09		2.33

*Over 6 in.; add 0.10¢ for 6 in. and under, from February through November 1946.

Cold-Rolled Strip at Pittsburgh

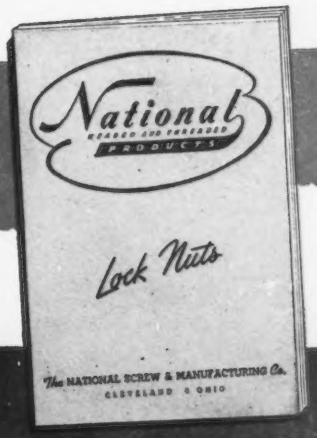
(cents per pound)

	1929	1932	1933	1934	1935	1936
January	2.85	1.92	1.88	2.40	2.60	2.60
February	2.85	1.90	1.80	2.40	2.60	2.60
March	2.80	1.96	1.80	2.40	2.60	2.60
April	2.75	2.00	1.80	2.50	2.60	2.60
May	2.75	2.00	1.88	2.80	2.60	2.60
June	2.75	2.00	2.00	2.80	2.60	2.60
July	2.75	2.00	2.19	2.64	2.60	2.60
August	2.75	2.00	2.25	2.60	2.60	2.60
September	2.75	1.92	2.29	2.60	2.60	2.60
October	2.75	1.90	2.40	2.60	2.60	2.60
November	2.75	2.00	2.40	2.60	2.60	2.60
December	2.75	2.00	2.40	2.60	2.60	2.80
Average	2.77	1.97	2.09	2.58	2.60	2.62

	1937	1938	1939	1940		1946
January	2.85	3.20	2.95	2.80		2.80
February	2.85	3.20	2.95	2.80		2.93
March	3.13	3.20	2.95	2.80	1945	3.05
April	3.20	3.20	2.95	2.68	1944	3.05
May	3.20	3.18	2.86	2.80	1943	3.05
June	3.20	3.07	2.80	2.80	1942	3.05
July	3.20	2.95	2.80	2.80	1941 price	3.05
August	3.20	2.95	2.80	2.80	fixed	3.05
September	3.20	2.95	2.80	2.80	at	3.05
October	3.20	2.83	2.80	2.80	2.60	3.05
November	3.20	2.95	2.80	2.80		3.05
December	3.20	2.95	2.80	2.80		3.17
Average	3.14	3.05	2.86	2.79		3.03

Select the right lock nut

with this new help...



Whatever your lock nut problem, one of these 4 distinct types should be exactly right for your particular job:

National "Drake" Lock Nuts

Two-piece, positive lock, especially suitable for heavy-duty applications where unusually severe stress, shock or vibration is encountered.

National "Dynamic" Lock Nuts

Thin, shear nut with diaphragm lock, for applications where a thin, one-piece locking medium of light weight is necessary and where strains would be in shear only.

National "Huglock" Nuts

One-piece, all-metal lock nut—the self-locking pre-set torque values are built in and insure vibration-proof results on all applications, even where high temperatures, oil or other types of moisture are involved.

National "Marsden" Lock Nuts

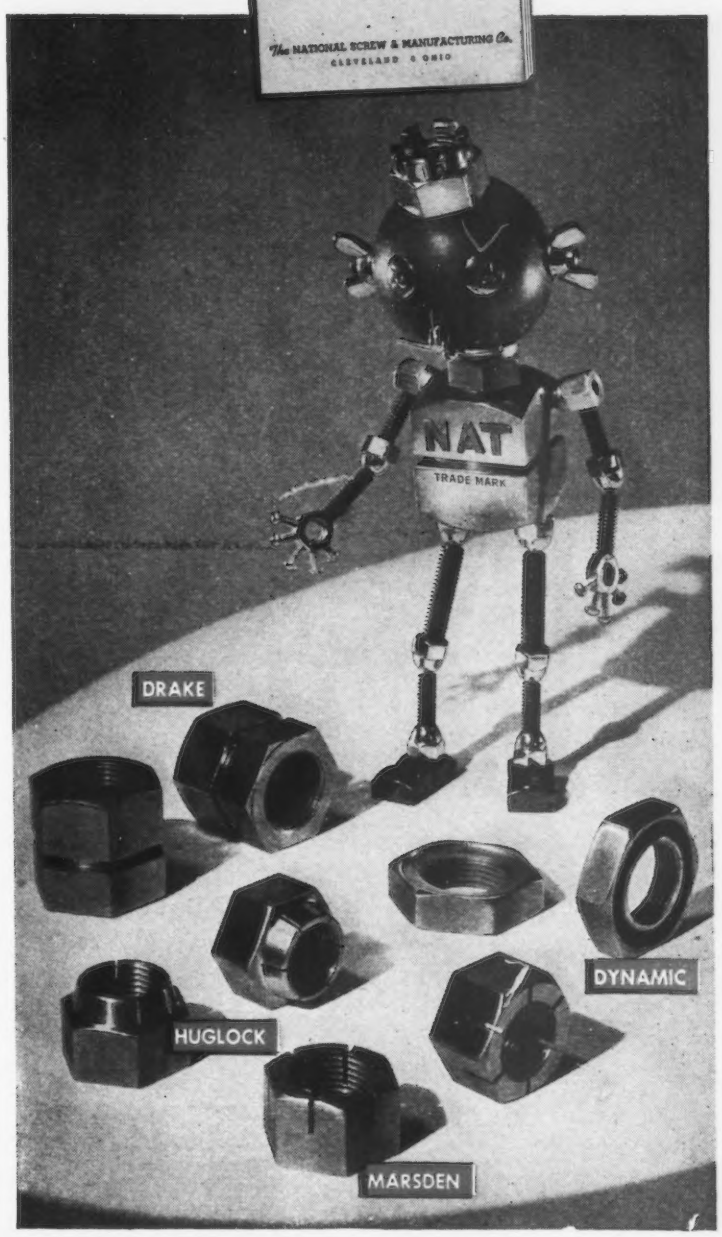
One-piece, cantilever action type-designed for effective locking action with minimum cost. Easily applied, free running until seated.

May we send you complete information? A request on your letterhead will bring you the new Lock Nut Catalog, without any obligation. Please send for it today.

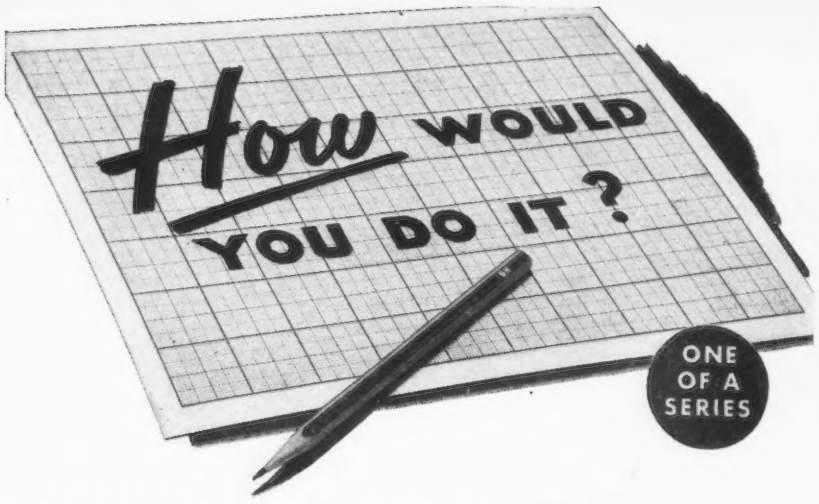
Other "National Screw" Specialties include:

- Clutch Head Screws
- Hi-Shear Rivet Pins & Collars
- Laminar Flow Screws
- Lok-Thred Studs
- Phillips Recessed Screws
- Rosan Locking System
- Screvets
- Sems

National
HEADED AND THREADED
PRODUCTS



THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.



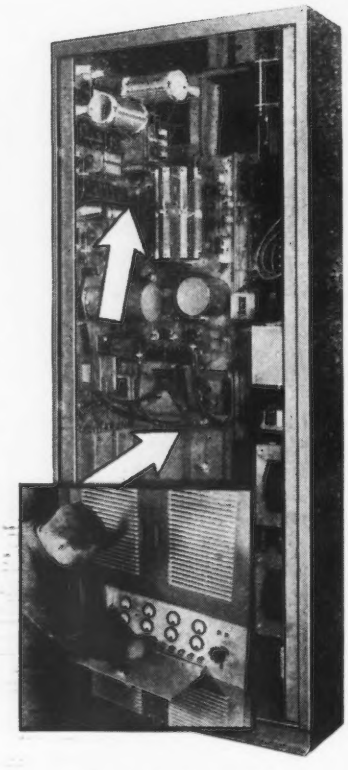
PROBLEM—You're designing a radio broadcast transmitter. The circuit includes condensers and other variable elements which must be adjusted by the operator. You want to place these elements for optimum circuit efficiency and where they will be easy to assemble, wire, and service. At the same time, you want to centralize the control knobs at a point convenient to the operator. How would you do it?

THE SIMPLE ANSWER

Use S.S.White remote control type flexible shafts to couple the variable elements to their control knobs. This leaves you free to place both the elements and the knobs anywhere you want them. And you get control that is as smooth and sensitive as a direct connection because S.S.White remote control flexible shafts are engineered **expressly** for this kind of service.

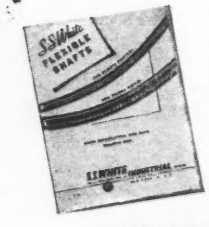
★ ★ ★

This is just one of hundreds of remote control and power drive problems to which S.S.White flexible shafts provide a simple answer. That's why every engineer should be familiar with the range and scope of these "Metal Muscles" for mechanical bodies.



Here's how one big radio manufacturer did it.

WRITE FOR BULLETIN 4501



It gives essential facts and engineering data about flexible shafts and their application. A copy is yours for the asking. Write for one today.

S.S.WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO. DEPT. I, 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
MOLDED RESISTORS • PLASTIC SPECIALTIES • CONTRACT PLASTICS MOLDING

One of America's AAAA Industrial Enterprises

Structural Shapes at Pittsburgh

(cents per pound)

	1929	1930	1931	1932	1933	1934
January	1.90	1.83	1.64	1.50	1.60	1.70
February	1.90	1.80	1.65	1.50	1.60	1.70
March	1.90	1.80	1.65	1.52	1.60	1.70
April	1.95	1.80	1.65	1.60	1.60	1.74
May	1.95	1.73	1.65	1.60	1.60	1.85
June	1.95	1.69	1.65	1.60	1.60	1.85
July	1.95	1.65	1.63	1.60	1.60	1.81
August	1.95	1.61	1.60	1.60	1.60	1.80
September	1.95	1.60	1.60	1.60	1.60	1.80
October	1.90	1.60	1.60	1.60	1.70	1.80
November	1.90	1.60	1.60	1.60	1.70	1.80
December	1.90	1.60	1.50	1.60	1.70	1.80
Average	1.92	1.69	1.62	1.57	1.68	1.78

	1935	1936	1937	1938		1946
January	1.80	1.80	2.05	2.25		2.10
February	1.80	1.80	2.05	2.25	1945	2.23
March	1.80	1.80	2.21	2.25	1944	2.35
April	1.80	1.80	2.25	2.25	1943	2.35
May	1.80	1.80	2.25	2.25	1942	2.35
June	1.80	1.80	2.25	2.22	1941	2.35
July	1.80	1.90	2.25	2.10	1940 1939	2.35
August	1.80	1.90	2.25	2.10	price	2.35
September	1.80	1.90	2.25	2.10	fixed	2.35
October	1.80	1.90	2.25	2.10	at	2.35
November	1.80	1.90	2.25	2.10	2.10	2.35
December	1.80	1.90	2.25	2.10		2.35
Average	1.80	1.85	2.21	2.17		2.32

Bright Wire at Pittsburgh

(cents per pound)

	1929	1931	1932	1933	1934	1935
January	2.50	2.20	2.20	2.16	2.20	2.30
February	2.50	2.20	2.20	2.10	2.20	2.30
March	2.50	2.20	2.20	2.10	2.20	2.30
April	2.50	2.20	2.20	2.10	2.23	2.30
May	2.50	2.20	2.20	2.10	2.30	2.30
June	2.50	2.20	2.20	2.10	2.30	2.30
July	2.50	2.20	2.20	2.10	2.30	2.30
August	2.43	2.20	2.20	2.10	2.30	2.30
September	2.40	2.20	2.20	2.10	2.30	2.30
October	2.40	2.20	2.20	2.10	2.30	2.30
November	2.40	2.20	2.20	2.10	2.30	2.30
December	2.40	2.20	2.20	2.20	2.30	2.30
Average	2.46	2.20	2.20	2.11	2.27	2.30

	1936	1937	1938		1945	1946
January	2.30	2.60	2.90		2.60	2.75
February	2.30	2.60	2.90	1944	2.60	2.90
March	2.30	2.84	2.90	1943	2.60	3.05
April	2.40	2.90	2.90	1942	2.60	3.05
May	2.40	2.90	2.90	1941	2.63	3.05
June	2.40	2.90	2.84	1940	2.75	3.05
July	2.40	2.90	2.60	1939	2.75	3.05
August	2.40	2.90	2.60	price fixed	2.75	3.05
September	2.40	2.90	2.60	at	2.75	3.05
October	2.50	2.90	2.60	2.60	2.75	3.05
November	2.50	2.90	2.60		2.75	3.05
December	2.60	2.90	2.60		2.75	3.05
Average	2.41	2.84	2.74		2.69	3.01

Steel Rails at Mill, Openhearth

(per gross ton)

	1929	1931	1932	1933	1934	1935
January	$43.00	$43.00	$43.00	$40.00	$36.37	$36.37
February	43.00	43.00	43.00	40.00	36.37	36.37
March	43.00	43.00	43.00	40.00	36.37	36.37
April	43.00	43.00	43.00	40.00	36.37	36.37
May	43.00	43.00	43.00	40.00	36.37	36.37
June	43.00	43.00	43.00	40.00	36.37	36.37
July	43.00	43.00	43.00	40.00	36.37	36.37
August	43.00	43.00	43.00	40.00	36.37	36.37
September	43.00	43.00	43.00	40.00	36.37	36.37
October	43.00	43.00	42.25	39.55	36.37	36.37
November	43.00	43.00	40.00	38.38	36.37	36.37
December	43.00	43.00	40.00	38.38	36.37	36.37
Average	43.00	43.00	42.44	39.26	36.37	36.37

	1936	1937	1938		1945	1946
January	$36.37	$39.00	$42.50		$40.00	$43.00
February	36.37	39.00	42.50	1944	40.00	43.19
March	36.37	41.80	42.50	1943	42.25	*43.39
April	36.37	42.50	42.50	1942	43.00	43.39
May	36.37	42.50	42.50	1941	43.00	43.39
June	36.37	42.50	42.50	1940	43.00	43.39
July	36.37	42.50	42.50	1939	43.00	43.39
August	36.37	42.50	42.50	price fixed	43.00	43.39
September	36.37	42.50	41.25	at	43.00	43.39
October	36.37	42.50	40.00	$40.00	43.00	43.39
November	36.37	42.50	40.00		43.00	43.39
December	39.00	42.50	40.00		43.00	47.36
Average	36.59	41.86	41.77		42.44	43.67

—* Net tons after Feb. 15, 1946.

Have you investigated

the possibilities of

SuVeneer *Trademark Reg. U. S. Pat. Off.

CLAD METALS...

Your material requirements may reveal the need for Superior SuVeneer Copper Clad Strip, which provides a combination of the characteristics of copper and the strength and physical properties of steel.

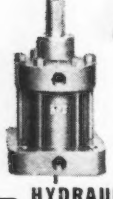
Why not have a Superior development engineer work with you on some of your copper and copper-alloy clad metal applications, and demonstrate the economy, ease of fabrication and dependability of SuVeneer Clad Metals?

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

SPECIFY

T-J

for Tough Jobs!



T-J HYDRAULIC CYLINDERS

T-J AIR CYLINDERS

T-J CLINCHORS

T-J Performance is helping plants throughout industry handle tough jobs at *top-speed* and *efficiency* . . . with *lower costs!*

Right now in your plant—there may be many jobs that T-J Products can perform faster and better. Check your needs for air cylinders . . . hydraulic cylinders . . . Rivitors . . . cutters . . . Clinchors . . . or air controls — these are products that T-J builds with ahead-of-the-times features! Backed by more than a quarter of a century's experience . . . T-J engineered and precision-built for utmost *accuracy* and *dependability.* Write for bulletins. The Tomkins-Johnson Co., Jackson, Mich.

T-J CUTTERS

T-J AIR CONTROLS

T-J RIVITORS

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

T-J

PRICES AND PRODUCTION

Standard Steel Pipe at Pittsburgh

(per net ton)

Computed from list discounts, for carload lots; price for base size pipe, 1 to 3 in.; ¾ to 3 in. prior to Apr. 13, 1931

	1929	1930	1931	1932	1933	1934
January	$70.30	$70.30	$68.50	$64.84	$65.00	$61.75
February	70.30	70.30	68.50	64.84	65.00	61.75
March	70.30	70.30	68.50	64.84	65.00	61.75
April	70.30	68.50	68.50	64.84	58.00	63.41
May	70.30	68.50	63.59	64.84	58.00	68.40
June	70.30	68.50	64.84	64.84	58.00	68.40
July	70.30	68.50	64.84	64.84	61.75	68.40
August	70.30	68.50	64.84	64.84	61.75	68.40
September	70.30	68.50	64.84	65.00	61.75	68.40
October	70.30	68.50	64.84	65.00	61.75	68.40
November	70.30	68.50	64.84	65.00	61.75	68.40
December	70.30	68.50	64.84	65.00	61.75	68.40
Average	70.30	67.45	65.29	64.89	61.63	66.32

	1935	1936	1937	1938		1946
January	$68.40	$68.40	$61.00	$71.00		$63.00
February	68.40	64.98	61.00	71.00	1945	68.00
March	68.40	61.80	69.00	71.00	1944	69.00
April	68.40	61.00	71.00	71.00	1943	69.00
May	68.40	61.00	71.00	71.00	1942	69.00
June	68.40	61.00	71.00	71.00	1941	69.00
					1940	
July	68.40	61.00	71.00	63.00	1939	69.00
August	68.40	61.00	71.00	63.00	price	69.00
September	68.40	61.00	71.00	63.00	fixed	69.00
October	68.40	61.00	71.00	63.00	at	69.00
November	68.40	61.00	71.00	63.00	$63.00	69.00
December	68.40	61.00	71.00	63.00		69.00
Average	68.40	62.01	69.17	67.00		68.25

Stainless Steel Sheets, No. 304

(cents per pound)

	1937		1946
January	35.00		38.00
February	35.00	1945	38.00
March	38.00	1944	38.00
April	38.00	1943	38.21
May	38.00	1942	38.95
June	38.00	1941	38.95
		1940	
July	38.00	1939	38.95
August	38.00	1938	38.95
September	38.00	price	38.95
October	38.00	fixed	38.95
November	38.00	at	38.95
December	38.00	36.00	38.95
Average	35.90		38.15

High Speed Tool Steel

18-4-1

(cents per pound)

	1937		1946
January	80.00		67.00
February	67.00	1945	67.00*
March	67.00	1944	67.00
April	67.00	1943	67.00
May	67.00	1942	67.00
June	67.00	1941	67.00
		1940	
July	67.00	1939	67.00
August	67.00	1938	67.00
September	80.00	price	67.00
October	80.00	fixed	67.00
November	80.00	at	67.00
December	80.00	67.00	67.00
Average	70.10		67.00*

* An increase of 8.2 pct applies to base price since Feb. 15, 1946.

Lake Superior Iron Ore Shipments

(water movement, gross tons)

1929	1932	1933	1934
65,204,600	3,567,985	21,623,898	22,249,600
1935	**1936**	**1937**	**1938**
28,362,368	44,822,023	62,598,836	19,263,011
1939	**1940**	**1941**	**1942**
45,072,725	63,712,982	80,116,360	92,028,328
1943	**1944**	**1945**	**1946**
94,533,434	80,358,890	75,894,750	59,536,716

World-famous Kinnear Features

Rugged all-steel construction

Coiling upward action that clears door openings completely

Effective counter-balance that assures smooth, easy operation

Strong, flexible interlocking steel-slat construction

Complete usability of all floor, wall and ceiling space around doorways

Every door is individually engineered to each opening

Many other important advantages

Kinnear Rolling Doors—the standard for door efficiency for half a century

KINNEAR Rolling Doors

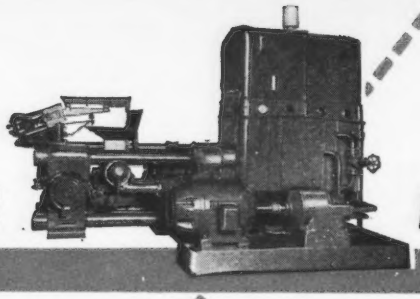
● In almost every part of the world, leading industrial and commercial firms know that the name "KINNEAR" stands for the best in service doors. Kinnear's famous interlocking-steel-slat design combines the strength of all-metal construction with the smooth efficiency of coiling upward action. These basic advantages give Kinnear doors *longer service life* with *lower maintenance costs,* which means greater door economy through the years. Kinnear Rolling Doors are built to fit openings of any size or proportions, and adapted to either old or new buildings. They are easily operated manually, or by chain or crank mechanism, and may be motor-operated if desired. We will gladly send complete details upon request.

THE KINNEAR MANUFACTURING CO.
1760-80 Fields Ave., Columbus 16, Ohio, U.S.A.

KINNEAR ROLLING DOORS

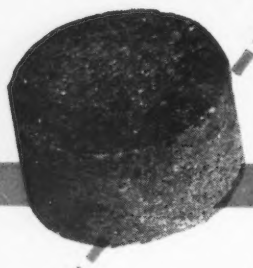
SAVING WAYS in DOORWAYS

THIS IS THE MACHINE THA



MODERN INDUSTRIAL FIRMS USE TO TUR

SCRAP METAL INTO A MOR



PROFITABLE BY-PRODUCT..

Bulky scrap metal from machining and milling operations becomes a more profitable by-product when compressed into compact briquettes with a Milwaukee Hydraulic Press. Many large industrial plants throughout the nation have found that this modern method of conserving metal pays *in space saved, in the higher percentage of materials reclaimed, in lower melting costs.*

New **BULLETIN!**

JUST OFF THE PRESS

Tells you about the advantages of briquetting borings and turnings . . . shows you how to salvage scrap *at a profit.* Without obligating you in any way, we'll gladly send you a copy of this bulletin. Write today.

Most Borings and Turnings Can Converted into Briquettes . .

BRASS
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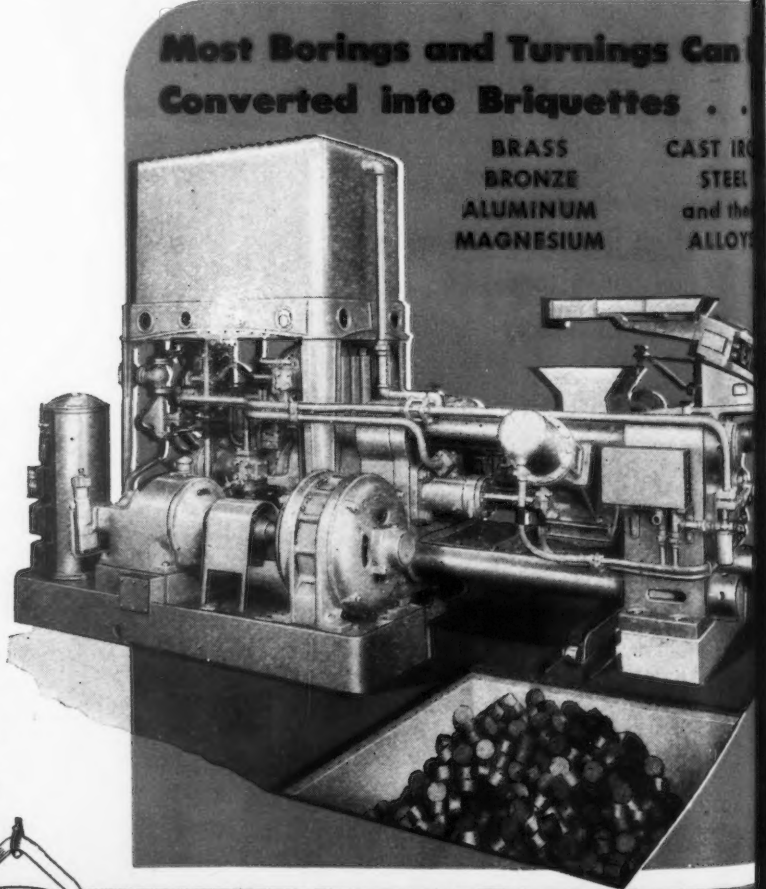


MILWAUKEE *Foundry Equipment Co*

3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.

Lake Superior Iron Ores

(per gross ton, at Lake Erie ports)

BESSEMER ORES

	Guarantee		Price	
	Iron Natural	Phosphorus Dry	Old Range	Mesa b
1914	55.00	0.045	$3.75	$3.50
1915	55.00	0.045	3.75	3.45
1916	55.00	0.045	4.45	4.20
1917	55.00	0.045	5.95	5.70
1918 to July 1	55.00	0.045	5.95	5.70
1918–July 1 to Sept. 30	55.00	0.045	6.40	6.15
1918–Oct. 1 on	55.00	0.045	6.65	6.40
1919	55.00	0.045	6.45	6.20
1920	55.00	0.045	7.45	7.20
1921	55.00	0.045	6.45	6.20
1922	55.00	0.045	5.95	5.70
1923	55.00	0.045	6.45	6.20
1924	55.00	0.045	4.65	5.40
1925 through 1928	51.50	0.045	4.55	4.40
1929 through 1936	51.50	0.045	4.80	4.65
1937 to Apr. 15, 1940	51.50	0.045	5.25	5.10
1940–Apr. 16 on	51.50	0.045	4.75	4.80
1941 through 1944	51.50	0.045	4.75	4.60
1945 to June 24, 1946	51.50	0.045	4.95	4.70
1946–June 24 on	51.50	0.045	5.45	5.20

NON-BESSEMER ORES

	Guarantee	Price		
	Iron Natural	Old Range	Mesabi	High Phosphorus
1914	51.50	$3.00	$2.85	....
1915	51.50	3.00	2.80	....
1916	51.50	3.70	3.55	....
1917	51.50	5.20	5.05	....
1918 to July 1	51.50	5.20	5.05	....
1918–July 1 to Sept. 30	51.50	5.65	5.50	....
1918–Oct. 1 on	51.50	5.90	5.75	....
1919	51.50	5.70	5.55	$5.35
1920	51.50	6.70	6.55	6.35
1921	51.50	5.70	5.55	5.35
1922	51.50	5.20	5.05	4.85
1923	51.50	5.70	5.55	5.35
1924	51.50	4.90	4.75	4.55
1925 through 1928	51.50	4.40	4.25	4.15
1929 through 1936	51.50	4.65	4.50	4.40
1937 to Apr. 15, 1940	51.50	5.10	4.95	4.85
1940–Apr. 16 on	51.50	4.60	4.45	4.35
1941 through 1944	51.50	4.60	4.45	4.35
1945 to June 24, 1946	51.50	4.80	4.55	4.55
1946–June 24 on	51.50	5.30	5.05	5.05

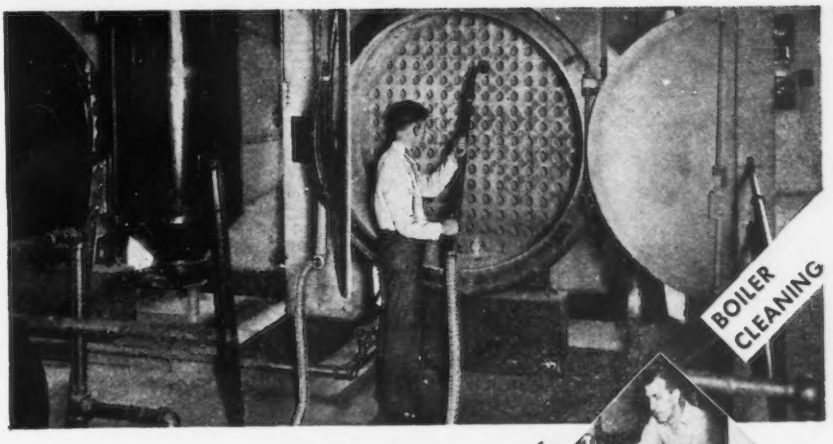
Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnaces and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia, in gross tons.

	1927	1928	1929	1930	1931	1932
January	$19.44	$17.63	$18.43	$18.19	$15.90	$14.68
February	19.07	17.73	18.38	18.02	15.80	14.51
March	19.03	17.73	18.36	17.75	15.71	14.45
April	19.21	17.67	18.52	17.73	15.79	14.35
May	19.09	17.45	18.70	17.60	15.76	14.12
June	18.92	17.23	18.65	17.48	15.62	14.01
July	18.56	17.10	18.48	17.16	15.56	13.76
August	18.17	17.11	18.39	16.90	15.51	13.69
September	18.03	17.54	18.27	16.70	15.44	13.64
October	17.96	17.94	18.33	16.31	15.21	13.63
November	17.59	18.46	18.36	16.21	14.97	13.59
December	17.55	18.51	18.24	15.95	14.86	13.56
Average	18.55	17.68	18.43	17.17	15.51	14.00

	1933	1934	1935	1936	1937	1938
January	$13.56	$16.90	$17.90	$18.84	$20.25	$23.25
February	13.56	16.90	17.90	18.84	20.50	23.25
March	13.56	16.90	17.90	18.84	22.85	23.25
April	13.76	17.07	17.90	18.84	23.25	23.25
May	14.48	17.90	17.85	18.84	23.25	23.25
June	15.01	17.90	17.84	18.84	23.25	22.98
July	15.50	17.90	17.84	18.84	23.25	19.61
August	16.09	17.90	17.84	18.73	23.25	19.61
September	16.71	17.90	17.84	18.73	23.25	19.82
October	16.61	17.90	17.87	18.73	23.25	20.57
November	16.61	17.90	18.84	18.98	23.25	20.61
December	16.90	17.90	18.84	19.73	23.25	20.61
Average	15.20	17.58	18.03	18.90	22.74	21.67

	1939	1940	1941		1945	1946
January	$20.61	$22.61	$23.45		$23.61	$25.37
February	20.61	22.61	23.45		24.11	25.37
March	20.61	22.61	23.53		24.61	25.75
April	20.61	22.61	23.61	1944	24.61	26.12
May	20.61	22.61	23.61	1943	24.61	26.45
June	20.61	22.61	23.61	1942	24.61	28.13
July	20.61	22.61	23.61	price fixed at	24.61	28.13
August	20.61	22.61	23.61	$23.61	24.61	28.13
September	21.61	22.61	23.61		24.61	28.13
October	22.61	22.61	23.61		24.91	28.13
November	22.61	22.61	23.61		25.37	28.13
December	22.61	22.95	23.61		25.37	29.64
Average	21.19	22.64	23.58		24.61	27.29



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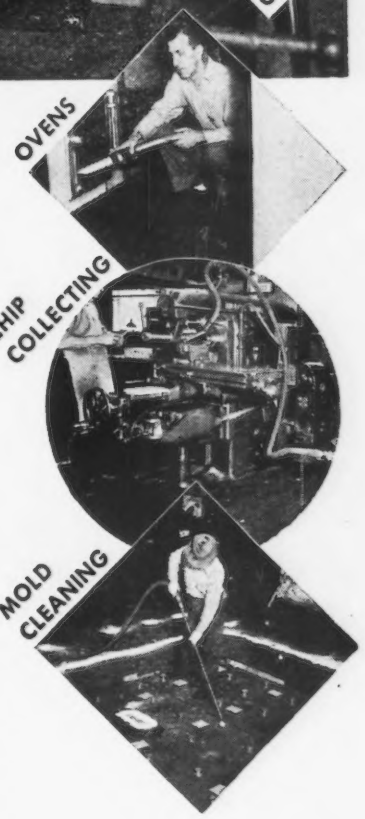
SPENCER VACUUM

In any plant, there are a dozen places where Spencer Vacuum could speed up and improve special operations, and at the same time reduce costs.

In the boiler room, soot is removed from tubes without blowing. Efficiencies are increased as much as 20%.

Cocoa shells and crumbs are removed from ovens in chocolate plants and bakeries. Chips are removed at the tool on delicate machining operations. Molds for castings weighing many tons are cleaned with a special Spencer vacuum tool. All this without blowing, without loss of time and with very low operating and maintenance costs. Ask for the Bulletins.



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No. 137—Boiler Cleaning
No. 102—Portable Vacuum Cleaners
No. 125—Central Vacuum Cleaners
No. 130—Sump Tank Cleaner
No. 143—Pneumatic Conveying
No. 142—Turbo-Agitation
No. 127—Turbo-Compressors
No. 109—Gas Boosters
No. 112—Foundry Blowers

1½ H.P. PORTABLE

324-A

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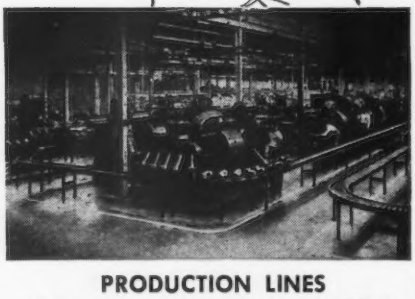

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Cases move fast into cars on sectional roller conveyors — with less manual handling.

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No. 2 Foundry Pig Iron at Chicago

(per gross ton, at furnace)

	1929	1933	1934	1935	1936	1937
January	$20.00	$15.50	$17.50	$18.50	$19.50	$21.00
February	20.00	15.50	17.50	18.50	19.50	21.25
March	20.00	15.50	17.50	18.50	19.50	23.60
April	20.00	15.50	17.75	18.50	19.50	24.00
May	20.00	15.80	18.50	18.50	19.50	24.00
June	20.00	16.00	18.50	18.50	19.50	24.00
July	20.00	16.78	18.50	18.50	19.50	24.00
August	20.00	17.10	18.50	18.50	19.50	24.00
September	20.00	17.50	18.50	18.50	19.50	24.00
October	20.00	17.50	18.50	18.70	19.50	24.00
November	20.00	17.50	18.50	19.50	19.75	24.00
December	20.00	17.50	18.50	19.50	20.50	24.00
Average	20.00	16.47	18.19	18.68	19.60	23.49

	1938	1939	1940		1945	1946
January	$24.00	$21.00	$23.00		$24.00	$25.75
February	24.00	21.00	23.00		24.50	25.75
March	24.00	21.00	23.00	1944	25.00	26.13
April	24.00	21.00	23.00	1943	25.00	26.50
May	24.00	21.00	23.00	1942	25.00	26.50
June	23.20	21.00	23.00	1941	25.00	26.50
July	20.00	21.00	23.00	price	25.00	26.50
August	20.00	21.00	23.00	fixed	25.00	26.50
September	20.25	22.00	23.00	at	25.00	26.50
October	21.00	23.00	23.00	$24.00	25.30	26.50
November	21.00	23.00	23.00		25.75	26.50
December	21.00	23.00	23.40		25.75	30.10
Average	22.20	21.59	23.03		25.02	27.64

No. 2 Foundry Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1929	1933	1934	1935	1936	1937
January	$17.50	$14.50	$17.50	$18.50	$19.50	$21.00
February	17.50	14.50	17.50	18.50	19.50	21.25
March	17.75	14.50	17.50	18.50	19.50	23.60
April	18.00	14.50	17.75	18.50	19.50	24.00
May	18.50	14.70	18.50	18.50	19.50	24.00
June	18.50	15.50	18.50	18.50	19.50	24.00
July	18.50	16.00	18.50	18.50	19.50	24.00
August	18.50	16.70	18.50	18.50	19.50	24.00
September	18.50	17.50	18.50	18.50	19.50	24.00
October	18.50	17.50	18.50	18.50	19.50	24.00
November	18.50	17.50	18.50	19.50	19.75	24.00
December	18.50	17.50	18.50	19.50	20.50	24.00
Average	18.23	15.91	18.19	18.67	19.60	23.49

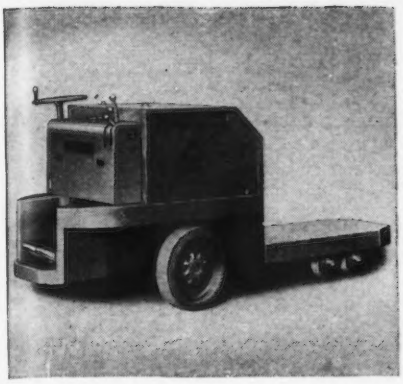
	1938	1939	1940		1945	1946
January	$24.00	$21.00	$23.00		$24.00	$25.75
February	24.00	21.00	23.00		24.50	25.75
March	24.00	21.00	23.00	1944	25.00	26.13
April	24.00	21.00	23.00	1943	25.00	26.50
May	24.00	21.00	23.00	1942	25.00	26.50
June	23.20	21.00	23.00	1941	25.00	26.50
July	20.00	21.00	23.00	price	25.00	26.50
August	20.00	21.00	23.00	fixed	25.00	26.50
September	20.25	22.00	23.00	at	25.00	26.50
October	21.00	23.00	23.00	$24.00	25.30	26.50
November	21.00	23.00	23.00		25.75	26.50
December	21.00	23.00	23.40		25.75	30.10
Average	22.20	21.59	23.03		25.02	27.64

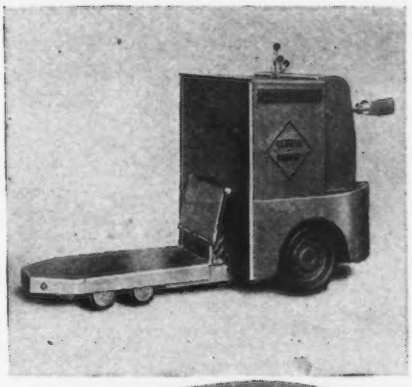
No. 2 Foundry Pig Iron at Buffalo

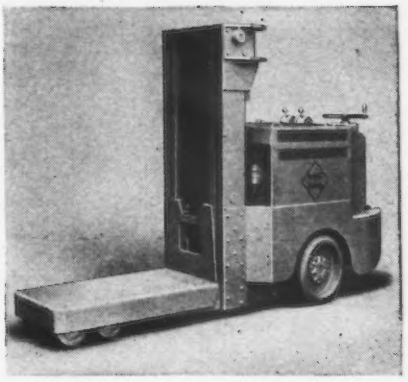
(per gross ton, at furnace)

	1929	1933	1934	1935	1936	1937
January	$18.00	$16.00	$17.50	$18.50	$19.50	$21.00
February	18.39	16.00	17.50	18.50	19.50	21.25
March	18.50	16.60	17.50	18.50	19.50	23.60
April	18.50	16.00	17.50	18.50	19.50	24.00
May	18.50	16.00	18.50	18.50	19.50	24.00
June	18.75	16.00	18.50	18.50	19.50	24.00
July	19.50	16.50	18.50	18.50	19.50	24.00
August	19.50	17.10	18.50	18.50	19.50	24.00
September	19.50	17.50	18.50	18.50	19.50	24.00
October	19.50	17.50	18.50	18.50	19.50	24.00
November	19.50	17.50	18.50	19.50	19.75	24.00
December	19.50	17.50	18.50	19.50	20.50	24.00
Average	18.97	16.63	18.17	18.67	19.60	23.49

	1938	1939	1940		1945	1946
January	$24.00	$21.00	$23.00		$24.00	$25.75
February	24.00	21.00	23.00		24.50	25.75
March	24.00	21.00	23.00	1944	25.00	26.13
April	24.00	21.00	23.00	1943	25.00	26.50
May	24.00	21.00	23.00	1942	25.00	26.50
June	23.20	21.00	23.00	1941	25.00	26.50
July	20.00	21.00	23.00	price	25.00	26.50
August	20.00	21.00	23.00	fixed	25.00	26.50
September	20.13	22.00	23.00	at	25.00	26.50
October	20.88	23.00	23.00	$24.00	25.30	26.50
November	21.00	23.00	23.00		25.75	26.50
December	21.00	23.00	23.40		25.75	30.10
Average	22.18	21.59	23.03		25.02	27.64







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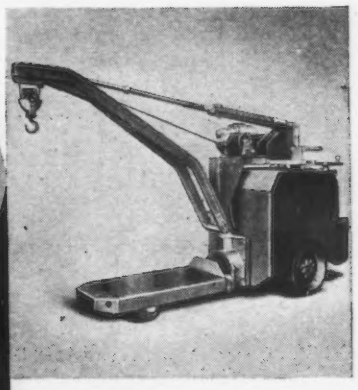

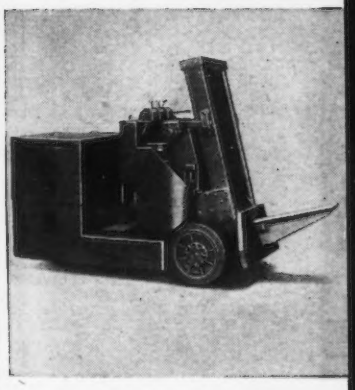

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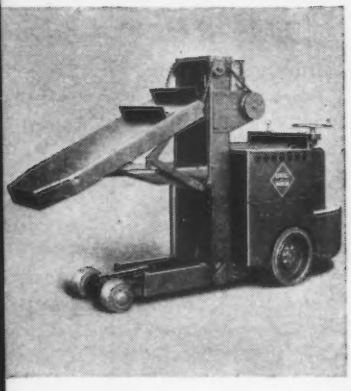

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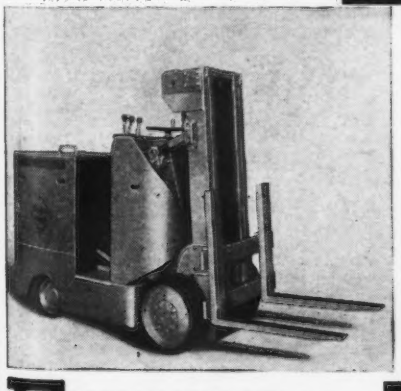

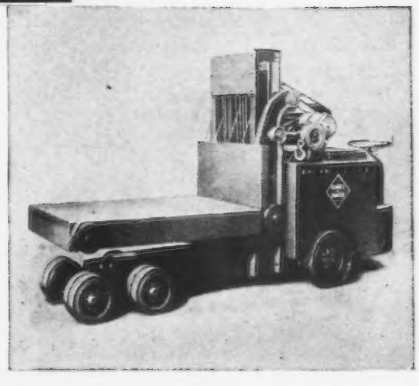

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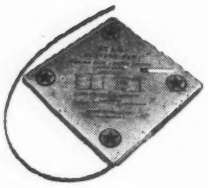

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No. 2 Foundry Pig Iron at Granite City, Ill.*

(per gross ton, at furnace)

	1929	1933	1934	1935	1936	1937
January	$20.75	$18.33	$17.50	$18.50	$19.50	$21.00
February	20.75	18.33	17.50	18.50	19.50	21.25
March	20.75	18.33	17.50	18.50	19.50	23.60
April	20.75	17.34	17.75	18.50	19.50	24.00
May	20.75	16.55	18.50	18.50	19.50	24.00
June	20.75	16.85	18.50	18.50	19.50	24.00
July	20.75	17.35	18.50	18.50	19.50	24.00
August	20.69	17.85	18.50	18.50	19.50	24.00
September	20.50	17.50	18.50	18.50	19.50	24.00
October	20.50	17.50	18.50	18.70	19.50	24.00
November	20.50	17.50	18.50	19.50	19.75	24.00
December	20.50	17.50	18.50	19.50	20.50	24.00
Average	20.66	17.58	18.19	18.68	19.60	23.49

	1938	1939	1940		1945	1946
January	$24.00	$21.00	$23.00		$24.00	$25.75
February	24.00	21.00	23.00		24.50	25.75
March	24.00	21.00	23.00	1944	25.00	26.13
April	24.00	21.00	23.00	1943	25.00	26.50
May	24.00	21.00	23.00	1942	25.00	26.50
June	23.00	21.00	23.00	1941	25.00	28.50
July	20.00	21.00	23.00	price fixed	25.00	28.50
August	20.00	21.00	23.00	at	25.00	28.50
September	20.25	22.00	23.00	$24.00	25.00	28.50
October	21.00	23.00	23.00		25.30	28.50
November	21.00	23.00	23.00		25.75	28.50
December	21.00	23.00	23.50		25.75	29.70
Average	22.20	21.59	23.04		25.02	27.44

* Prior to Sept. 1933, St. Louis prices are given.

Southern No. 2 Foundry Pig Iron at Birmingham (per gross ton)

	1929	1934	1935	1936	1937	1938
January	$16.50	$13.50	$14.50	$15.50	$17.38	$20.38
February	16.50	13.50	14.50	15.50	17.68	20.38
March	16.00	13.50	14.50	15.50	19.93	20.38
April	15.40	13.50	14.50	15.50	20.38	20.38
May	15.00	14.30	14.50	15.50	20.38	20.38
June	15.00	14.50	14.50	15.50	20.38	19.58
July	14.63	14.50	14.50	15.50	20.38	16.38
August	14.50	14.50	14.50*	15.88	20.38	16.38
September	14.50	14.50	14.50	15.88	20.38	16.63
October	14.50	14.50	14.50	15.88	20.38	17.38
November	14.50	14.50	14.75	16.13	20.38	17.38
December	14.50	14.50	15.50	16.88	20.38	17.38
Average	15.13	14.15	14.60	15.76	19.87	18.58

	1939	1940	1941		1945	1946
January	$17.38	$19.38	$19.38		$20.38	$22.13
February	17.38	19.38	19.38		20.86	22.13
March	17.38	19.38	19.89		21.38	22.51
April	17.38	19.38	20.38	1944	21.38	22.88
May	17.38	19.38	20.38	1943	21.38	22.88
June	17.38	19.38	20.38	1942	21.38	24.88
July	17.38	19.38	20.38	price fixed	21.38	24.88
August	17.38	19.38	20.38	at	21.38	24.88
September	18.38	19.38	20.38	$20.38	21.38	24.88
October	19.38	19.38	20.38		21.68	24.88
November	19.38	19.38	20.38		22.13	24.88
December	19.38	19.38	20.38		22.13	26.88
Average	17.96	19.38	20.17		21.40	24.06

* Subject to 38¢ a ton deduction for 0.70 phosphorous.

Lake Superior Charcoal Pig Iron at Chicago (per gross ton)

	1929	1936	1937	1938	1939	1940
January	$27.04	$25.25	$26.54	$30.24	$28.34	$30.34
February	27.04	25.25	26.79	30.24	28.34	30.34
March	27.04	25.25	29.44	30.24	28.34	30.34
April	27.04	25.25	30.04	30.32	28.34	30.34
May	27.04	25.25	30.04	30.34	28.34	30.34
June	27.04	25.25	30.04	30.34	28.34	30.34
July	27.04	25.25	30.04	28.34	28.34	30.34
August	27.04	25.25	30.04	28.34	28.34	30.34
September	27.04	25.25	30.04	28.34	29.34	30.34
October	27.04	25.25	30.04	28.34	30.34	30.34
November	27.04	25.50	30.16	28.34	30.34	30.34
December	27.04	26.25	30.24	28.34	30.34	30.34
Average	27.04	25.35	29.45	29.31	28.92	30.34

	1941	1942	1943	1944	1945	1946
January	$30.34	$31.34	$31.34	$37.34	$37.34	$42.34
February	30.34	31.34	31.34	37.34	37.34	42.34
March	30.34	31.34	31.34	37.34	41.09	42.34
April	30.34	31.34	31.34	37.34	42.34	42.34
May	31.09	31.34	31.34	37.34	42.34	42.34
June	31.34	31.34	31.34	37.34	42.34	42.34
July	31.34	31.34	31.34	37.34	42.34	42.34
August	31.34	31.34	31.34	37.34	42.34	42.34
September	31.34	31.34	37.34	37.34	42.34	42.34
October	31.34	31.34	37.34	37.34	42.34	42.34
November	31.34	31.34	37.34	37.34	42.34	42.34
December	31.34	31.34	37.34	37.34	42.34	42.73
Average	30.99	31.34	33.34	37.34	41.40	

Malleable Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1929	1933	1934	1935	1936	1937
January	$18.00	$14.50	$17.50	$18.50	$19.50	$21.00
February	18.00	14.50	17.50	18.50	19.50	21.25
March	18.25	14.50	17.50	18.50	19.50	23.80
April	18.50	14.50	17.75	18.50	19.50	24.00
May	19.00	14.70	18.50	18.50	19.50	24.00
June	19.00	15.50	18.50	18.50	19.50	24.00
July	19.00	16.00	18.50	18.50	19.50	24.00
August	19.00	16.70	18.50	18.50	19.50	24.00
September	19.00	17.50	18.50	18.50	19.50	24.00
October	19.00	17.50	18.50	18.50	19.50	24.00
November	19.00	17.50	18.50	19.50	19.75	24.00
December	19.00	17.50	18.50	19.50	20.50	24.00
Average	18.73	15.91	18.19	18.67	19.60	23.49

	1938	1939	1940		1945	1946
January	$24.00	$21.00	$23.00		$24.00	$25.75
February	24.00	21.00	23.00		24.50	25.75
March	24.00	21.00	23.00	1944	25.00	26.13
April	24.00	21.00	23.00	1943	25.00	26.50
May	24.00	21.00	23.00	1942	25.00	26.50
June	23.00	21.00	23.00	1941	25.00	28.50
July	20.00	21.00	23.00	price fixed	25.00	28.50
August	20.00	21.00	23.00	at	25.00	28.50
September	20.25	22.00	23.00	$24.00	25.00	28.50
October	21.00	23.00	23.00		25.30	28.50
November	21.00	23.00	23.00		25.75	28.50
December	21.00	23.00	23.50		25.75	30.10
Average	22.20	21.59	23.04		25.02	27.48

Basic Pig Iron at Mahoning or Shenango Valley Furnaces

(per gross ton)

	1929	1933	1934	1935	1936	1937
January	$17.50	$13.50	$17.00	$18.00	$19.00	$20.50
February	17.50	13.50	17.00	18.00	19.00	20.75
March	17.50	13.50	17.00	18.00	19.00	23.10
April	17.90	13.50	17.25	18.00	19.00	23.50
May	18.38	14.20	18.00	18.00	19.00	23.50
June	18.50	15.00	18.00	18.00	19.00	23.50
July	18.50	15.50	18.00	18.00	19.00	23.50
August	18.50	16.20	18.00	18.00	19.00	23.50
September	18.50	17.00	18.00	18.00	19.00	23.50
October	18.50	17.00	18.00	18.00	19.00	23.50
November	18.50	17.00	18.00	19.00	19.25	23.50
December	18.50	17.00	18.00	19.00	20.00	23.50
Average	18.19	15.24	17.69	18.17	19.10	22.99

	1938	1939	1940		1945	1946
January	$23.50	$20.50	$22.50		$23.50	$25.25
February	23.50	20.50	22.50		24.00	25.25
March	23.50	20.50	22.50	1944	24.50	25.63
April	23.50	20.50	22.50	1943	24.50	26.00
May	23.50	20.50	22.50	1942	24.50	26.00
June	22.70	20.50	22.50	1941	24.50	28.00
July	19.50	20.50	22.50	price fixed	24.50	28.00
August	19.50	20.50	22.50	at	24.50	28.00
September	19.75	21.50	22.50	$23.50	24.50	28.00
October	20.50	22.50	22.50		24.80	28.00
November	20.50	22.50	22.50		25.25	28.00
December	20.50	22.50	22.90		25.25	29.60
Average	21.70	21.09	22.53		24.52	27.14

Scrap Composite Price

Average of THE IRON AGE *quotations on No. 1 heavy melting scrap at Pittsburgh, Chicago and Philadelphia—gross ton.*

	1929	1935	1936	1937	1938	1939
January	$17.02	$12.29	$13.47	$18.33	$14.00	$14.94
February	16.96	11.98	14.12	19.27	13.86	15.01
March	16.71	11.06	14.75	21.25	13.46	15.20
April	17.18	10.46	14.59	21.02	12.40	14.77
May	16.54	10.70	13.39	18.54	11.54	14.17
June	16.39	10.74	12.81	17.28	11.32	14.71
July	16.60	10.96	13.29	18.79	13.29	14.92
August	16.86	12.25	15.04	20.43	14.51	15.43
September	16.60	12.71	16.45	18.73	14.34	18.32
October	15.78	12.67	16.63	15.89	14.21	21.48
November	14.83	12.90	16.31	13.34	14.74	19.66
December	14.15	13.33	17.10	13.46	14.88	18.05
Average	16.30	11.85	14.83	18.03	13.54	16.39

	1940	1941		1944	1945	1946
January	$17.58	$20.88		$19.17	$19.17	$19.17
February	16.88	20.08		19.17	19.17	19.17
March	16.56	20.29		19.17	19.17	19.17
April	16.14	19.22	1943	19.17	19.17	19.17
May	17.60	19.17	1942	19.17	19.05	19.17
June	19.31	19.17	price fixed	19.17	19.00	19.17
July	18.47	19.17	at	19.17	19.17	19.17
August	18.72	19.17	$19.17	19.10	19.17	19.17
September	19.91	19.17		17.87	19.17	19.17
October	20.63	19.17		15.87	19.17	19.17
November	20.83	19.17		16.54	19.17	23.34
December	21.42	19.17		19.04	19.17	23.37
Average	18.67	19.49		18.55	19.15	20.28

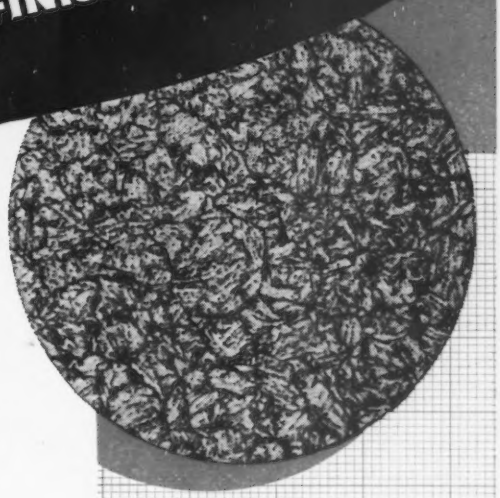
streamline YOUR PRODUCTION *with*

WYCKOFF
Heat Treated COLD FINISHED STEEL

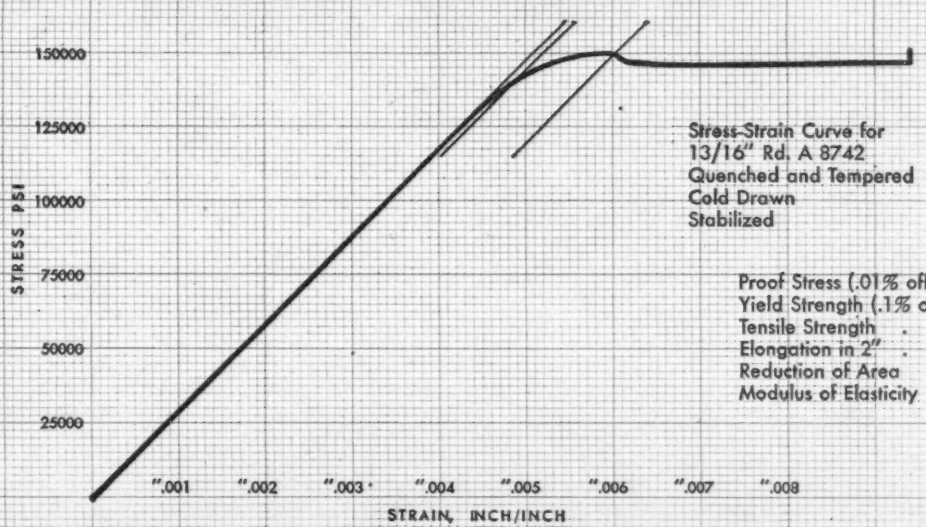
TAKE the heat treating, cleaning and straightening 'stops' out of the smooth flow of your parts production with Wyckoff Heat Treated Cold Finished Steel.

Machine your highly stressed parts from Wyckoff Heat Treated Steels that possess the required physical properties—without interrupting production to create these properties and without worry about distortion.

Wyckoff Heat Treated Steel is furnished to your individual requirements—gives pre-determined uniformity of production stock that makes every part machine the same . . . perform the same . . . eliminates laborious hardness testing of finished parts.



X 1000

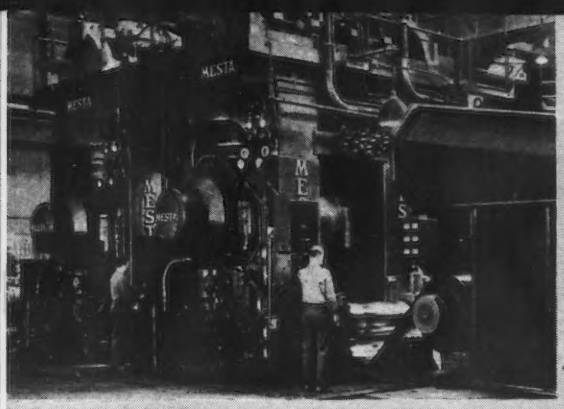


Stress-Strain Curve for
13/16" Rd. A 8742
Quenched and Tempered
Cold Drawn
Stabilized

Proof Stress (.01% offset)	144,500 psi
Yield Strength (.1% offset)	151,000 psi
Tensile Strength	152,500 psi
Elongation in 2"	17.0%
Reduction of Area	56.8%
Modulus of Elasticity	29,300,000 psi

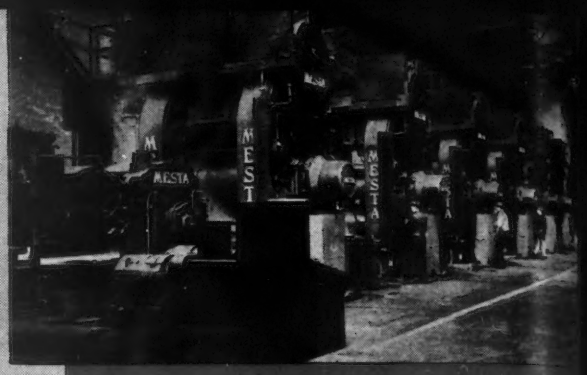
Wyckoff STEEL COMPANY

FIRST NATIONAL BANK BUILDING, PITTSBURGH 30, PA.
3200 S. KEDZIE AVENUE, CHICAGO 23, ILLINOIS
Works at: AMBRIDGE, PA.; CHICAGO, Ill.; PUTNAM, Conn.; NEWARK, N. J.
Manufacturers of Carbon and Alloy Steels — Turned and Polished Shafting — Turned and Ground Shafting — Wide Flats up to 12" x 2"



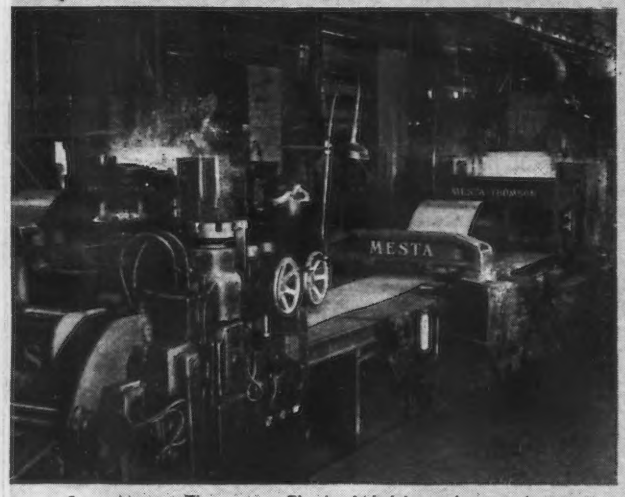
All required tempers can be produced on this Mesta 48" High Speed, Twin Four-High Cold Skin Pass Mill

Mesta 56" Four-High Continuous Hot Sheet Strip Mill

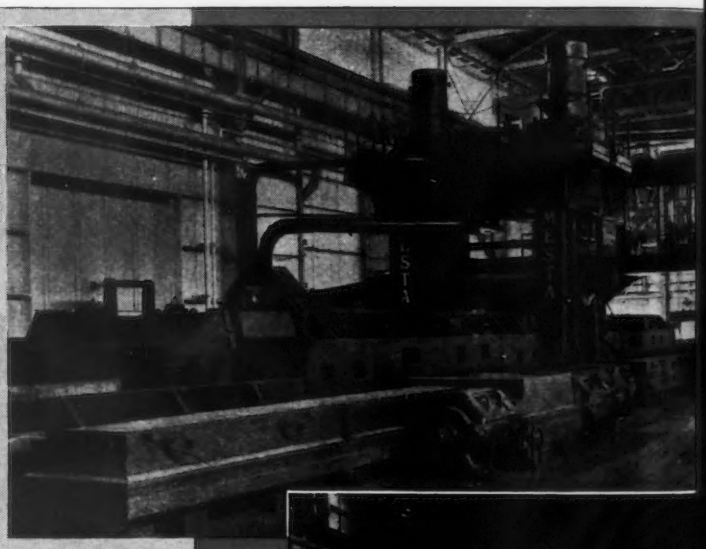


MESTA

WORLD'S LEADING DESIGNERS

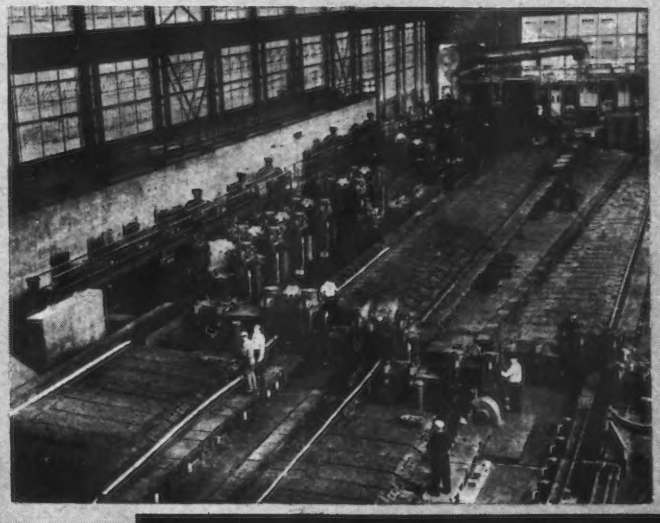


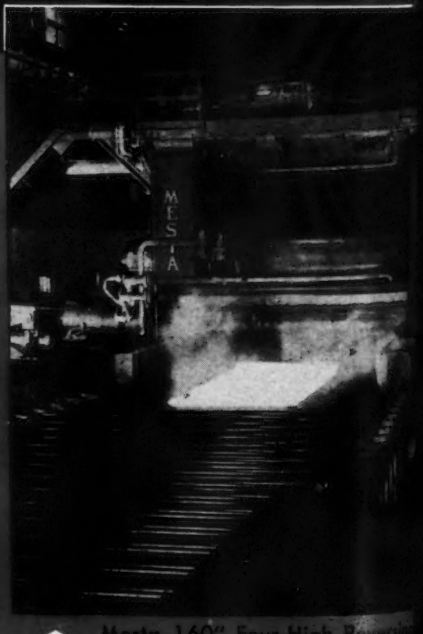
Mesta-Thomson Flash Welders located at the entry end of two Mesta Continuous Pickling Lines



Mesta 46" Reversing Slabbing-Blooming Mill, Tables and Manipulators

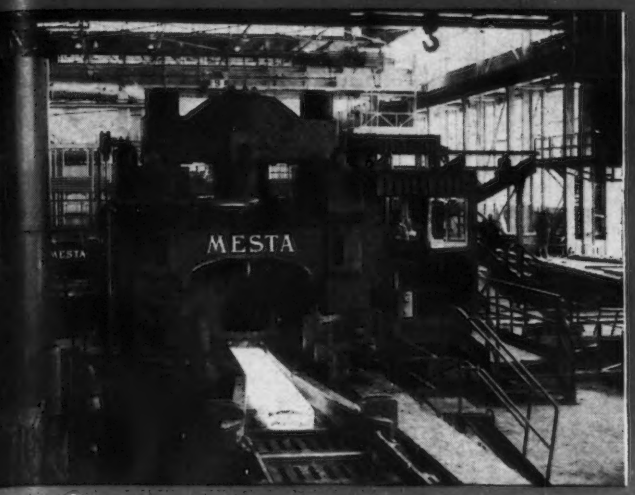
Mesta 18"-14"-10" Merchant Mills and Transfers





Mesta 160" Four-High Reversing Mill, Side Guards and Entering

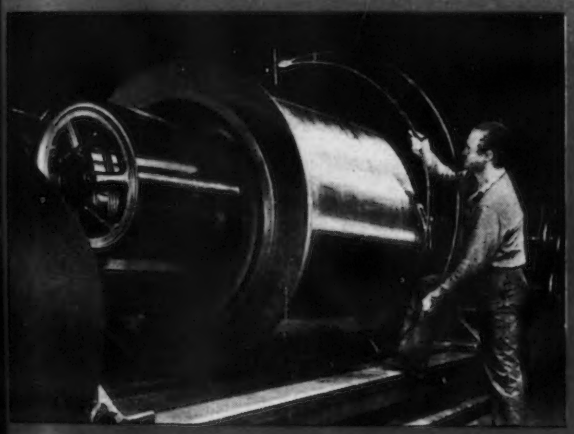
MESTA MACHINE COMPANY



Mesta Hydraulic Up-Cut Bloom Shear

Mesta Two-High and Three-High 29" Structural Mills and Traveling Tilting Table

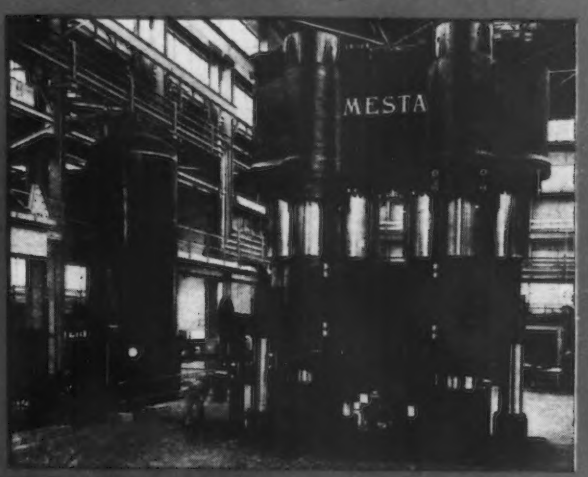
nd BUILDERS of COMPLETE STEEL PLANTS



Mesta 56" diameter Special Alloy Cast Steel Backing-Up Roll for a modern high speed four-high cold reduction mill

Battery of five 42" Mesta High Speed Electrolytic Cleaning Lines

Mesta 54" Four-High, Four Stand Tandem Mill for the cold reduction of thin sheet strip and galvanizing stock



18,000 Ton Hydraulic Die-Forging Press for magnesium and light alloys. This unit, designed, built and installed complete by Mesta, is the world's largest four-column press

PITTSBURGH, PA.

Cap Screws in All Sizes and All Four Heads

Known around the World...

Tough, rugged, TRIPLEX threaded fasteners have a world-wide reputation for quality. They are engineered for hard service and long life.

Cap Screws in particular have to "take a beating" in today's high speed machinery and equipment. Using TRIPLEX Cap Screws will minimize your service and maintenance problems.

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THE TRIPLEX SCREW COMPANY

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TRIPLEX THREADED FASTENERS

CAP AND SET SCREWS · BOLTS, NUTS AND RIVETS

PRICES AND PRODUCTION

No. 1 Heavy Melting Scrap at Pittsburgh

(per gross ton)

	1929	1935	1936	1937	1938	1939
January	$19.31	$13.35	$14.44	$19.50	$14.25	$15.72
February	18.63	13.06	14.96	19.81	14.13	15.72
March	18.44	12.19	15.75	23.15	13.67	15.97
April	18.60	11.55	15.75	22.25	12.44	15.31
May	17.88	11.62	14.50	19.38	11.50	14.48
June	18.25	11.75	13.57	18.45	11.30	15.12
July	18.55	11.95	14.19	19.75	14.25	15.56
August	19.00	12.94	15.94	21.85	15.45	16.15
September	18.31	13.25	17.80	19.62	15.25	19.88
October	17.30	13.40	17.87	16.62	15.00	23.05
November	16.39	13.56	17.31	13.75	15.28	20.56
December	15.45	14.05	18.31	13.75	15.75	18.58
Average	18.01	12.72	15.87	18.86	14.02	17.17

	1940	1941		1944	1945	1946
January	$18.35	$22.13		$20.00	$20.00	$20.00
February	17.50	21.00		20.00	20.00	20.00
March	16.88	21.00		20.00	20.00	20.00
April	16.55	20.20	1943	20.00	20.00	20.00
May	18.37	20.00	1942	20.00	20.00	20.00
June	20.06	20.00	price fixed	20.00	20.00	20.00
July	19.10	20.00	at	20.00	20.00	20.00
August	18.56	20.00	$20.00	19.95	20.00	20.00
September	20.00	23.00		18.25	20.00	20.00
October	21.45	20.00		16.10	20.00	20.00
November	21.69	20.00		17.13	20.00	23.94
December	22.28	20.00		19.94	20.00	29.05
Average	19.23	20.36		19.28	20.00	21.08

No. 1 Heavy Melting Scrap at Philadelphia

(per gross ton)

	1929	1935	1936	1937	1938	1939
January	$16.39	$11.40	$12.62	$17.37	$14.75	$15.25
February	16.39	11.62	13.25	18.50	14.75	15.25
March	16.13	10.50	13.75	19.60	14.55	15.38
April	17.00	10.00	13.69	20.00	13.37	15.62
May	16.39	10.44	12.81	18.62	12.13	15.25
June	16.00	10.50	12.00	17.20	12.20	15.41
July	16.50	10.55	12.31	19.00	13.63	15.62
August	16.50	11.44	14.00	19.75	14.35	18.25
September	16.39	12.38	15.40	19.00	14.25	18.87
October	15.70	12.10	15.75	16.38	14.75	22.36
November	15.00	12.13	15.12	13.75	14.75	20.75
December	14.50	12.50	15.50	14.25	15.12	18.92
Average	16.07	11.30	13.85	17.78	14.05	17.09

	1940	1941		1944	1945	1946
January	$18.00	$20.50		$18.75	$18.75	$18.75
February	17.38	20.00		18.75	18.75	18.75
March	17.12	20.00		18.75	18.75	18.75
April	16.75	19.00	1943	18.75	18.75	18.75
May	17.56	18.75	1942	18.75	18.40	18.75
June	19.69	18.75	price fixed	18.75	18.25	18.75
July	18.95	18.75	at	18.75	18.75	18.75
August	19.56	18.75	$18.75	18.60	18.75	18.75
September	20.50	18.75		16.66	18.75	18.75
October	20.70	18.75		14.60	18.75	18.75
November	20.75	18.75		15.50	18.75	22.94
December	20.85	18.75		18.50	18.75	28.00
Average	18.98	19.13		17.01	18.68	19.87

No. 1 Heavy Melting Scrap at Chicago

(per gross ton)

	1929	1935	1936	1937	1938	1939
January	$15.39	$11.80	$13.37	$17.81	$13.00	$13.87
February	15.88	11.25	14.19	19.25	12.69	13.94
March	15.66	10.50	14.75	20.60	12.15	14.25
April	15.95	9.85	14.34	20.56	11.37	13.37
May	15.39	10.06	12.87	17.12	11.00	12.75
June	14.94	9.97	12.85	15.70	10.45	13.46
July	14.75	10.35	13.37	17.62	12.00	13.50
August	15.06	12.38	15.19	19.70	13.75	13.87
September	15.13	12.50	16.15	17.56	13.50	16.22
October	14.30	12.50	16.25	14.69	12.88	19.16
November	13.15	13.00	16.50	12.50	14.20	17.86
December	12.50	13.25	17.00	12.38	13.75	16.87
Average	14.84	11.45	14.74	17.12	12.56	14.91

	1940	1941		1944	1945	1946
January	$16.38	$20.00		$18.75	$18.75	$18.75
February	15.75	19.25		18.75	18.75	18.75
March	15.69	19.88		18.75	18.75	18.75
April	15.33	18.95	1943	18.75	18.75	18.75
May	17.00	18.75	1942	18.75	18.75	18.75
June	18.19	18.75	price fixed	18.75	18.75	18.75
July	17.35	18.75	at	18.75	18.75	18.75
August	18.03	18.75	$18.75	18.75	18.75	18.75
September	19.22	18.75		18.69	18.75	18.75
October	19.75	18.75		16.90	18.75	18.75
November	20.06	18.75		17.00	18.75	23.13
December	20.60	18.75		18.69	18.75	28.05
Average	17.73	19.01		18.27	18.75	19.99

Tops FOR THINGS MADE OF STEEL

Manufacturers are looking more and more to Continental for steel sheets, manufacturer's wire and many other special steel products. Continental Chain Link fence is made of KONIK steel to provide low cost property protection through longer life. Steel sheets and roofing in a wide variety of bases and coatings are made to meet the specific needs of their application. Continental manufacturer's wire is supplied as small as a thread or as large as a bar, in standard and special shapes and in many different finishes and coatings. Nails, staples, and many other steel products round out the Continental line and make it really "Tops" in steel. All Continental products are made from open hearth steel and are uniformly processed and finished according to the needs of their use. Write for your copy of the Manufacturer's Folder today.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

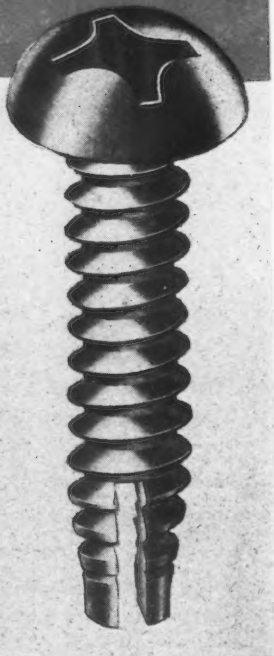
PRODUCERS OF STEEL SHEETS, including Continental GALVANIZED, COPPER-STEEL Galvanized, KONIK steel sheets Galvanized, UNIFORM SPANGLE Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL, Hot Rolled Pickled, and many styles of Formed Roofing. **ALSO,** Manufacturer's Wire in many sizes, shapes, tempers, and finishes, Continental Chain Link Fence, Nails, and other steel products.

ELIMINATE
TAPPING COSTS

Here's how it's done. The slot, corresponding to flutes of a tap, provides two balanced cutting edges and a chip reservoir. *In photo, note chips cut and pushed ahead.*

HOLTITE "TAP" SCREWS

U.S. Patent No. 2,292,195 Other patents pending.



Do not confuse this remarkable new screw with the ordinary self-tapping screws that forcibly displace the material by a cold forging action.

Fundamentally a narrow fluted two-flute tap, this new "TAP" screw actually removes the material when *cutting* its own perfect mating threads to effect tighter, stronger fastenings that resist vibration.

Fine or curled metal chips, and tough, gummy non-metallic cuttings free themselves readily in the open slot reservoir to prevent binding. The two balanced cutting edges of slot cut threads much deeper than their own diameter.

Eliminate tapping operations by using HOLTITE "TAP" screws in metal, castings, alloy, rubber, plastics, etc. You'll get stronger fastenings at less cost!

CONTINENTAL
SCREW CO. New Bedford, Mass., U.S.A.

No. 1 Machinery Cast Scrap at Chicago

(per gross ton*)

	1929	1933	1934	1935	1936	1937
January	$15.81	$6.25	$9.50	$10.60	$12.00	$15.87
February	16.25	6.25	9.50	10.00	12.75	16.25
March	16.00	6.25	9.50	9.38	13.10	17.40
April	16.00	7.06	9.50	9.00	12.50	17.12
May	15.39	8.45	8.90	9.00	12.00	15.25
June	14.75	8.75	7.50	9.00	12.00	15.00
July	14.50	10.63	8.05	9.30	12.12	15.75
August	14.50	10.50	8.00	10.87	13.37	16.55
September	14.50	10.00	8.00	11.19	13.60	14.38
October	14.50	9.88	8.00	11.25	14.00	13.18
November	13.63	8.60	8.25	11.50	14.00	11.65
December	13.50	8.76	9.65	11.80	14.75	12.12
Average	15.11	8.45	8.69	10.24	13.02	15.04

	1938	1939	1940	1941†	1945†	1946
January	$12.50	$12.56	$14.00	$18.88		$20.00
February	12.19	12.75	13.75	19.25		20.00
March	11.65	12.75	13.56	20.75		20.00
April	10.88	12.12	14.81	*22.33		20.00
May	10.75	11.75	16.31	21.40	1944	20.00
June	10.45	12.15	17.31	20.00	1943	20.00
July	12.00	12.25	16.75	20.00	1942 price	20.00
August	13.35	12.25	16.88	20.00	fixed	20.00
September	13.00	14.50	17.13	20.00	at	22.50
October	12.25	16.87	17.75	20.00	$20.00	25.00
November	12.60	15.65	18.00	20.00		32.28
December	12.50	14.50	19.13	20.00		41.05
Average	12.01	13.34	16.28	20.21		23.40

* Changed from net ton basis April 30, 1941.
† Ceiling price does not include delivery costs.

No. 1 Machinery Cast Scrap at Cincinnati

(per gross ton)

	1929	1933	1934	1935	1936	1937
January	$17.14	$7.55	$9.50	$10.25	$11.37	$15.75
February	17.24	6.50	9.50	9.94	11.75	16.12
March	17.19	6.50	10.00	9.19	12.40	17.30
April	17.19	6.50	10.00	8.75	12.19	17.37
May	17.19	6.75	9.45	8.87	11.50	14.44
June	17.19	7.13	9.00	9.06	11.20	14.00
July	17.19	8.75	9.00	9.10	11.19	14.87
August	17.05	9.50	8.88	9.94	12.43	16.25
September	16.96	9.50	8.75	10.00	13.60	14.25
October	16.92	9.50	8.75	10.50	14.00	13.38
November	16.57	9.12	8.88	10.50	14.00	11.85
December	16.52	9.19	9.85	10.90	15.12	10.75
Average	17.03	8.04	9.30	9.75	12.56	14.69

	1938	1939	1940	1941†	1945†	1946
January	$11.25	$13.75	$17.65	$22.75		$20.00
February	10.87	13.75	16.69	22.50		20.00
March	11.05	14.38	16.25	*22.50		20.00
April	10.62	13.56	16.05	....		20.00
May	10.25	12.00	16.88	....	1944	20.00
June	10.10	12.13	19.38	....	1943	20.00
July	11.75	12.25	18.65	....	1942 price	20.00
August	12.65	12.80	18.75	....	fixed	20.00
September	12.31	15.38	20.12	*22.50	at	22.50
October	12.31	19.55	20.55	22.50	$20.00	25.00
November	13.15	18.88	21.00	22.50		26.25
December	13.88	17.75	22.50	22.50		30.00
Average	11.68	14.68	18.71	....		21.98

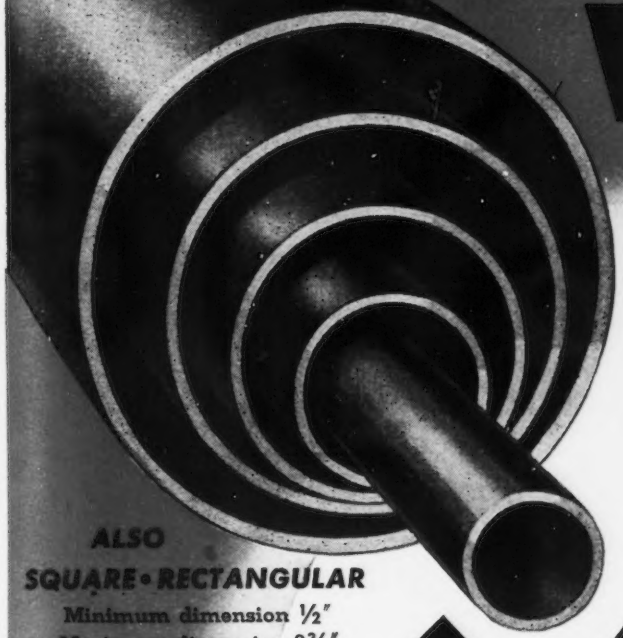
* In transition from open market quotations to OPA price maximums, this grade not quoted. However, in September, the maximum schedules are revised to include this grade.
† Ceiling price does not include delivery costs.

Magnesium, 99.8 Pct Plus, at New York

(cents per pound)

1929	56.00	1935	30.00	1941	27.00
1930	48.00	1936	30.00	1942	22.50
1931	34.00	1937	30.00	1943	20.50
1932	29.00	1938	30.00	1944	20.50
1933	28.00	1939	27.00	1945	20.50
1934	26.00	1940	27.00	1946	20.50

Michigan WELDED STEEL TUBING



ROUND

1/4" to 4" O.D.
9 to 22 gauge

ALSO
SQUARE • RECTANGULAR
Minimum dimension ½"
Maximum dimension 2¾"
14 to 20 gauge.

IN SIZES AND SHAPES WITHIN THE ABOVE RANGE
FOR YOUR PARTICULAR FABRICATING NEEDS!

More than 25 years in the business has acquainted us thoroughly with the needs of manufacturers of parts made from welded steel tubing. Not only is Michigan tubing available in the most frequently specified size range but its structure and manufacture is closely guarded for satisfactory and economical reforming and machining into parts.

PARTS PREFABRICATED

Michigan is completely equipped to fabricate your parts for you. Michigan welded steel tubing can be forged, flanged, expanded, bent, spun, tapered, beaded, machined, etc.

Engineering advice and technical help in the selection of tubing best suited to your needs.

Michigan STEEL TUBE PRODUCTS CO.

More Than 25 Years in the Business

9450 BUFFALO STREET • DETROIT 12, MICHIGAN

FACTORIES: DETROIT, MICHIGAN • SHELBY, OHIO

DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

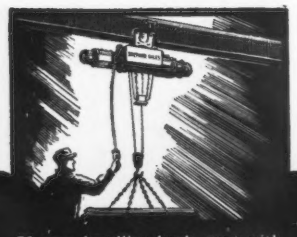
Arms and Legs that never tire!

In heavy industry, loads to lift, move and deposit are reckoned in tons. No human muscles can endure such work day after day and year after year.

Shepard Niles electric cranes, made by America's oldest builder of electric cranes and hoists, are made in styles and sizes to take care of every heavy handling job—and to do it smoothly, easily, safely, economically and efficiently.

There's a type Shepard Niles crane to solve *your* handling problem. Trained, experienced Shepard Niles engineers, familiar with the requirements of thousands of crane users, will gladly study your needs and recommend, without obligation, the crane best suited to do your job.

A Shepard Niles crane of the right type will help you enjoy competitive advantages not possible without the best material handling equipment.



If your handling loads start with an eighth ton, why not look into the advantages of a Shepard Niles electric hoist? There are over 5,000 styles and sizes from which to select. There's one to fit your needs. Ask us to help you select it.

Shepard Niles
CRANE & HOIST CORPORATION

356 SCHUYLER AVE. • MONTOUR FALLS, N. Y.

◈—PRICES AND PRODUCTION—◈

Aluminum, 99 Pct Plus

(cents per pound, delivered; f.o.b., freight allowed after April 10, 1946)

	1929	1932	1933	1934	1935	1936
January....	23.90	23.30	23.30	23.30	20.50	20.50
February...	23.90	23.30	23.30	21.65	20.50	20.50
March.....	23.90	23.30	23.30	21.65	20.50	20.50
April.....	23.90	23.30	23.30	21.65	20.50	20.50
May.....	23.90	23.30	23.30	21.65	20.50	20.50
June.....	23.90	23.30	23.30	21.65	20.50	20.50
July.....	23.90	23.30	23.30	21.65	20.50	20.50
August.....	23.90	23.30	23.30	21.65	20.50	20.50
September..	23.90	23.30	23.30	21.65	20.50	20.50
October....	23.90	23.30	23.30	21.49	20.50	20.50
November..	23.90	23.30	23.30	20.50	20.50	20.50
December..	23.90	23.30	23.30	20.50	20.50	20.50
Average	23.90	23.30	23.30	21.58	20.50	20.50

	1937	1938	1939	1940	1941	
January....	20.50	20.00	20.00	20.00	17.00	
February...	20.50	20.00	20.00	20.00	17.00	
March.....	20.00	20.00	20.00	20.00	17.00	1946
April.....	20.00	20.00	20.00	20.00	17.00	1945
May.....	20.00	20.00	20.00	20.00	17.00	1944
June.....	20.00	20.00	20.00	20.00	17.00	1943
July.....	20.00	20.00	20.00	20.00	17.00	1942 price
August.....	20.00	20.00	20.00	20.00	17.00	fixed
September..	20.00	20.00	20.00	20.00	17.00	at
October....	20.00	20.00	20.00	20.00	15.00	15.00
November..	20.00	20.00	20.00	20.00	15.00	
December..	20.00	20.00	20.00	20.00	15.00	
Average	20.08	20.00	20.00	20.00	16.87	

Electrolytic Copper, Conn. Valley

(cents per pound)

	1929	1932	1933	1934	1935	1936
January....	16.84	7.33	5.00	6.18	9.00	9.25
February...	18.05	6.25	5.00	8.00	9.00	9.25
March.....	21.38	5.99	5.26	8.00	9.00	9.25
April.....	19.93	5.79	5.68	8.39	9.00	9.40
May.....	18.00	5.51	6.93	8.50	9.00	9.50
June.....	18.00	5.39	8.00	8.82	8.88	9.50
July.....	18.00	5.28	8.91	9.00	8.00	9.60
August.....	18.00	5.43	9.00	9.00	8.22	9.75
September..	18.03	6.21	9.00	9.00	8.77	9.75
October....	18.00	5.97	8.25	9.00	9.19	9.85
November..	18.00	5.31	8.16	9.00	9.25	10.43
December..	18.00	5.04	8.12	9.00	9.25	11.00
Average	18.35	5.79	7.28	8.66	8.88	9.71

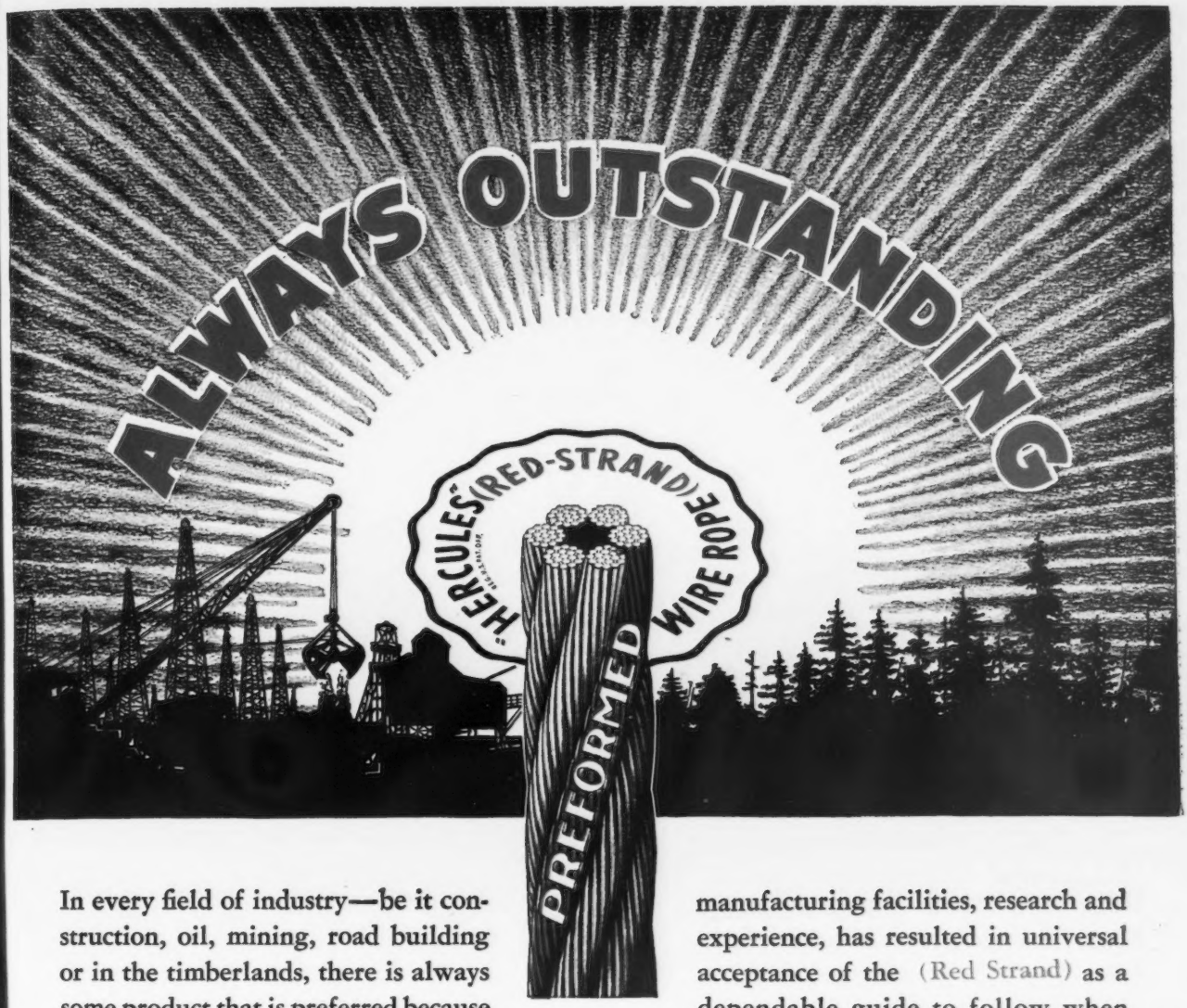
	1937	1938	1939	1940		1946
January....	12.66	10.42	11.25	12.22		12.00
February...	13.60	10.00	11.25	11.40		12.00
March.....	15.99	10.00	11.25	11.38	1945	12.00
April.....	15.35	10.00	10.47	11.33	1944	12.00
May.....	14.00	9.60	10.06	11.32	1943	12.00
June.....	14.00	9.00	10.00	11.37	1942	14.28
July.....	14.00	9.81	10.22	10.81	1941 price	14.375
August.....	14.00	10.12	10.49	10.95	fixed	14.375
September..	13.78	10.25	11.93	11.54	at	14.375
October....	12.06	10.98	12.44	12.00	12.00	14.375
November..	11.02	11.25	12.50	12.00		17.22
December..	10.24	11.25	12.50	12.00		19.50
Average	13.39	10.22	11.20	11.53		14.04

Zinc at New York

(cents per pound)

	1929	1933	1934	1935	1936	1937
January....	6.70	3.38	4.62	4.08	5.22	6.20
February...	6.70	3.04	4.73	4.06	5.23	6.60
March.....	6.80	3.37	4.72	4.25	5.27	7.75
April.....	7.04	3.68	4.72	4.38	5.27	7.70
May.....	6.98	4.17	4.71	4.60	5.27	7.10
June.....	7.00	4.70	4.59	4.67	5.26	7.10
July.....	7.10	5.24	4.68	4.70	5.16	7.27
August.....	7.15	5.28	4.63	4.92	5.17	7.56
September..	7.15	5.08	4.43	5.04	5.22	7.54
October....	7.09	5.12	4.19	5.21	5.22	6.45
November..	6.63	4.87	4.08	5.23	5.35	5.98
December..	6.09	4.82	4.06	5.22	5.64	5.36
Average	6.87	4.40	4.51	4.70	5.27	6.90

	1938	1939	1940	1941		1946
January....	5.35	4.89	6.03	7.65		8.65
February...	5.17	4.89	5.93	7.65		8.65
March.....	4.77	4.89	6.14	7.65		8.65
April.....	4.53	4.89	6.14	7.65	1945	8.65
May.....	4.43	4.89	6.20	7.65	1944	8.65
June.....	4.53	4.89	6.63	7.65	1943	8.65
July.....	5.14	4.91	6.64	7.65	1942 price	8.69
August.....	5.14	5.11	6.79	7.65	fixed	8.69
September..	5.24	6.51	7.33	7.65	at	8.69
October....	5.40	6.89	7.64	8.36	8.65	9.28
November..	5.12	6.89	7.64	8.65		10.63
December..	4.89	6.46	7.65	8.65		10.94
Average	4.98	5.51	6.73	7.88		9.07



In every field of industry—be it construction, oil, mining, road building or in the timberlands, there is always some product that is preferred because of its dependability . . . and in Wire Rope, "HERCULES" (Red Strand) has continued to enjoy an "outstanding" reputation for over 68 years.

Naturally, there are many reasons for this recognition. First of all, is our own high standards established for the selection and testing of the materials that go into its making.

This unwavering policy, backed by unexcelled manufacturing facilities, research and experience, has resulted in universal acceptance of the (Red Strand) as a dependable guide to follow when buying Wire Rope.

Being made in a wide range of constructions — Round Strand and Flattened Strand . . . Preformed and Non-Preformed . . . there is a style exactly suited to meet *any* heavy duty demand.

Call on our engineering department any time for specific recommendations—they'll welcome your inquiries.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS
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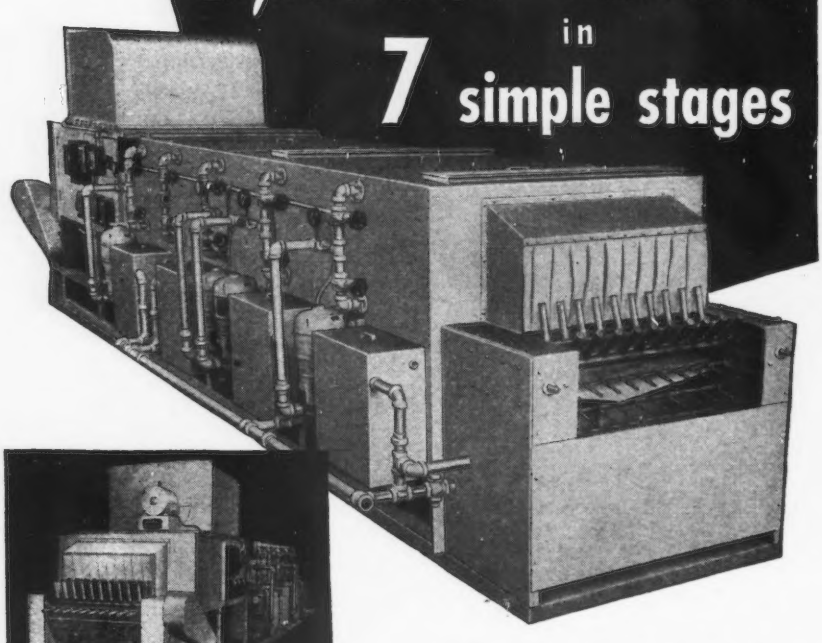
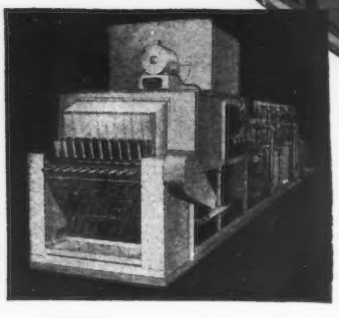
Speedier CLEANING in 7 simple stages





ABOVE: Loading end of Machine

LEFT: Discharge end of Machine

The cleaning of cylindrical brass cases following polishing and directly prior to plating, was a problem in a large metal parts manufacturing plant. The **OPTIMUS** Flat Conveyor Type Washing Machine shown above, now handles this operation in seven simple consecutive stages: Hot Alkali Wash, Drain, Hot Water Rinse, Warm Sodium Cyanide Wash, Cold Rinse to Sewer, Hot Rinse, Dry.

The entire operation takes the parts directly from polishing and feeds direct to the plating machine, the entire cleaning operation being timed to fit in with these other steps. The two hot rinses are hooked in sequence, thus effecting a further operating saving. Conveyor can also be built with flight bars for baskets and individual pieces, or with a mesh belt for any type of parts in bulk or individual pieces.

- *The* **RIGHT** *Machine*
- *The* **PROPER** *Detergent*
- *The* **CORRECT** *Cleaning Method*

OPTIMUS
Provides them all!

An **OPTIMUS** Plan for the mechanized handling of your metal parts through washing, degreasing, rinsing and drying, can assist you in saving labor, materials and speeding up production. Submit your problems to **OPTIMUS.**

OPTIMUS EQUIPMENT COMPANY
ENGINEERS AND MANUFACTURERS
137 CHURCH STREET, MATAWAN, N. J.

STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS EQUIPMENT
FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

◈—PRICES AND PRODUCTION—◈

Lead at New York

(cents per pound)

	1929	1933	1934	1935	1936	1937
January	6.65	3.00	4.00	3.69	4.50	6.00
February	6.85	3.00	4.00	3.53	4.51	6.23
March	7.41	3.15	4.00	3.58	4.60	7.19
April	7.19	3.27	4.18	3.69	4.60	6.32
May	7.00	3.65	4.14	3.96	4.60	6.00
June	7.00	4.17	3.98	4.02	4.60	6.00
July	6.80	4.46	3.77	4.12	4.60	6.00
August	6.75	4.50	3.75	4.25	4.60	6.45
September	6.88	4.50	3.68	4.41	4.60	6.40
October	6.87	4.32	3.65	4.51	4.63	5.75
November	6.29	4.29	3.57	4.50	5.11	5.03
December	6.25	4.14	3.60	4.50	5.55	4.87
Average	6.83	3.87	3.86	4.06	4.71	6.02

	1938	1939	1940	1941		1948
January	4.87	4.83	5.47	5.50		6.50
February	4.63	4.80	5.08	5.60		6.50
March	4.50	4.82	5.19	5.77		6.50
April	4.50	4.78	5.07	5.85	1945	6.50
May	4.40	4.75	5.02	5.85	1944	6.50
June	4.15	4.80	5.00	5.85	1943	8.18
					1942	
July	4.88	4.85	5.00	5.85	price	9.18
August	4.90	5.04	4.85	5.85	fixed	8.25
September	5.00	5.45	4.93	5.85	at	8.25
October	5.10	5.50	5.31	5.85	6.50	8.25
November	5.09	5.50	5.73	5.85		10.59
December	4.84	5.50	5.50	5.85		12.25
Average	4.74	5.05	5.18	5.79		8.12

Straits Tin at New York

(cents per pound)

	1929	1933	1934	1935	1936	1937
January	49.21	22.70	51.98	50.91	47.23	50.90
February	49.39	23.51	51.78	49.99	47.94	52.10
March	48.85	24.35	53.84	48.88	48.00	52.74
April	45.93	27.16	55.66	50.05	48.97	53.02
May	43.88	35.94	53.57	51.10	48.31	55.64
June	44.20	44.23	51.31	51.08	42.24	55.88
July	46.29	46.28	51.94	52.31	42.96	59.34
August	46.60	44.71	51.99	50.46	42.57	59.40
September	45.32	46.46	51.52	49.05	44.77	58.64
October	42.25	47.95	51.01	51.25	44.95	51.52
November	40.18	53.14	51.24	51.88	51.30	43.34
December	39.87	52.91	50.92	49.77	51.85	42.96
Average	45.16	39.12	52.23	50.39	46.42	54.29

	1938	1939	1940	1941		1948
January	41.54	46.39	46.73	50.16		52.00
February	41.23	45.64	45.85	51.41		52.00
March	41.16	46.17	47.07	52.07		52.00
April	38.41	47.16	46.96	52.03	1945	52.00
May	36.83	49.00	51.51	52.18	1944	52.00
June	40.36	48.81	54.64	52.68	1943	52.00
					1942	
July	43.38	48.53	51.61	53.41	price	52.00
August	43.28	48.80	51.21	52.45	fixed	52.00
September	43.40	Nom.	50.30	52.00	at	52.00
October	45.25	55.68	51.50	52.00	52.00	52.00
November	46.29	52.65	50.57	52.00		61.00
December	46.21	51.40	50.11	52.00		70.00
Average	42.28	49.11	49.84	52.03		54.00

50 Pct Ferrosilicon

(carloads, per gross ton, delivered East of Mississippi River)

	1929	1935	1936	1937	1938	1939
January	$83.50	$77.50	$77.50	$69.50	$69.50	$69.50
February	83.50	77.50	77.50	69.50	69.50	69.50
March	83.50	77.50	77.50	69.50	69.50	69.50
April	83.50	77.50	77.50	69.50	69.50	69.50
May	83.50	77.50	77.50	69.50	69.50	69.50
June	83.50	77.50	77.50	69.50	69.50	69.50
July	83.50	77.50	69.50	69.50	69.50	69.50
August	83.50	77.50	69.50	69.50	69.50	69.50
September	83.50	77.50	69.50	69.50	69.50	69.50
October	83.50	77.50	69.50	69.50	69.50	69.50
November	83.50	77.50	69.50	69.50	69.50	69.50
December	83.50	77.50	69.50	69.50	69.50	69.50
Average	83.50	77.50	73.50	69.50	69.50	69.50

	1940		1943	1944*	1945*	1948*
January	$69.50		$74.50	6.65¢	6.65¢	6.65¢
February	69.50		74.50	6.65	6.65	6.65
March	69.50		74.50	6.65	6.65	6.65
April	69.50		74.50	6.65	6.65	6.65
May	69.50	1942	74.50	6.65	6.65	6.65
June	72.00	1941	74.49	6.65	6.65	6.65
		price				
July	74.50	fixed	6.65¢*	6.65	6.65	7.05
August	74.50	at	6.65	6.65	6.65	7.05
September	74.50	$74.50	6.65	6.65	6.65	7.05
October	74.50		6.65	6.65	6.65	7.05
November	74.50		6.65	6.65	6.65	7.05
December	74.50		6.65	6.65	6.65	7.05
Average	72.11		6.65	6.65	6.65	6.65

* Cents per lb of contained Si.

Bliss' Stamping Grounds

RAILS AND TIES for Lionel electric toy trains are assembled at the rate of 1250 per hour in this Bliss No. 21 Inclinable Press with 48", 8-Station Bliss dial feed and a staking die.

MINIATURE PRESSED METAL VERSIONS of the "real thing" are the toy manufacturers' contribution to a youngster's world of make-believe. Authentic streamlined electric trains that puff smoke, futuristic autos and planes, miniature typewriters, refrigerators, jeeps, tractors...all are "musts" in playing grown-up.

As you'd expect, Bliss leads the stamping press parade in this ever-changing march-of-the-toys, for Bliss makes every type and size of press—mechanical and hydraulic—necessary to blank, draw, form and assemble an endless variety of playthings, as well as their counter-parts in real life. While one Bliss press is busy forming the entire turret top of *your* new car, another is stamping its toy copy for the kids. A massive 2500 ton press blanks two boxcar chassis frames at a stroke, while smaller machines complete whole miniature "railroads" for the "living room express."

Toyland is but another of "Bliss' Stamping Grounds." Here, too, as in so many mass-production industries, Bliss equipment contributes mightily to profitable low-cost manufacture. In some way Bliss press-building experience—90 years of it—can help in solving your production problem. Try putting it up to Bliss.

E. W. BLISS COMPANY, DETROIT 2, MICH.

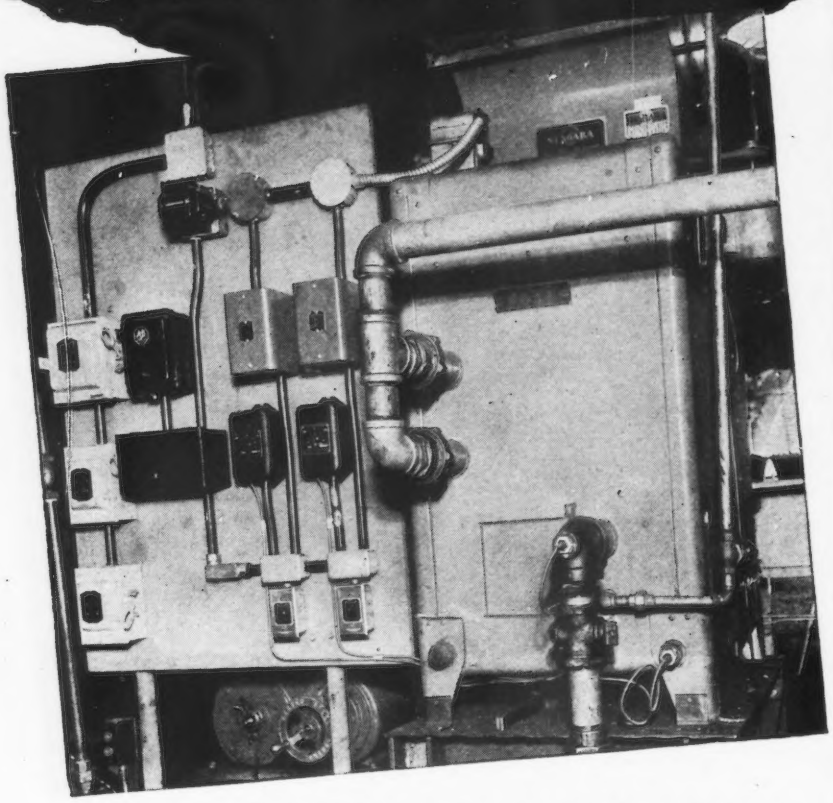
WORKS AT: Brooklyn, N. Y.; Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France • SALES OFFICES: Detroit; Brooklyn; Cleveland, Dayton, Toledo, Ohio; Lansing, Mich.; Chicago; Philadelphia; Rochester; New Haven; Boston; Toronto.

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY

STAY AHEAD WITH Bliss

For Mechanical and Hydraulic Presses
Rolling Mills
Can and Container Machinery

LET *Air* DO THE WORK OF COOLING



● The **NIAGARA AERO HEAT EXCHANGER** makes the atmospheric air take up the heat you want to remove from power equipment or industrial process. It is done by the evaporation of a small amount of water, removing 1000 BTU for every pound of water evaporated. With this method it is also easy to control temperatures closely . . . to assure accuracy in process results . . . speeding up production at lower cost.

Well designed and built to last, **NIAGARA AERO HEAT EXCHANGERS** have made an excellent record for reliability in service and freedom from maintenance trouble and expense.

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Field Engineering Offices in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

PRICES AND PRODUCTION

Ferromanganese, 80 Pct

(carloads, per gross ton, at seaboard)

	1929	1934	1935	1936	1937	1938
January	$105.00	$85.00	$85.00	$75.00	$80.00	$102.50
February	105.00	85.00	85.00	75.00	80.00	102.50
March	105.00	85.00	85.00	75.00	89.00	102.50
April	105.00	85.00	85.00	75.00	95.00	102.50
May	105.00	85.00	85.00	75.00	100.62	102.50
June	105.00	85.00	85.00	75.00	102.50	102.50
July	105.00	85.00	85.00	75.00	102.50	92.50
August	105.00	85.00	85.00	75.00	102.50	92.50
September	105.00	85.00	85.00	75.00	102.50	92.50
October	105.00	85.00	85.00	75.00	102.50	92.50
November	105.00	85.00	85.00	80.00	102.50	92.50
December	105.00	85.00	85.00	80.00	102.50	92.50
Average	105.00	85.00	85.00	75.83	96.84	97.50

	1939	1940	1941	1942		1946
January	$85.00	$100.00	$120.00	$120.00		$135.00
February	80.00	100.00	120.00	120.00		135.00
March	80.00	100.00	120.00	120.00		135.00
April	80.00	100.00	120.00	120.00	1945	135.00
May	80.00	100.00	120.00	135.00	1944	135.00
June	80.00	110.00	120.00	135.00	1943	135.00
July	80.00	120.00	120.00	135.00	price fixed	135.00
August	80.00	120.00	120.00	135.00	at	135.00
September	95.00	120.00	120.00	135.00	$135.00	135.00
October	100.00	120.00	120.00	135.00		135.00
November	100.00	120.00	120.00	135.00		135.00
December	100.00	120.00	120.00	135.00		135.00
Average	86.67	110.84	120.00	130.00		135.00

Spiegeleisen, 19 to 21 Pct

(carloads, per gross ton, Palmerton, Pa.)

	1929	1932	1933	1934	1935	1936
January	$31.00	$26.00	$24.00	$27.00	$26.00	$26.00
February	31.00	26.00	24.00	27.00	26.00	26.00
March	31.00	26.00	24.00	26.50	26.00	26.00
April	31.00	26.00	24.00	26.00	26.00	26.00
May	31.00	26.00	24.00	24.00	26.00	26.00
June	31.00	25.75	24.00	26.00	26.00	26.00
July	31.00	25.00	27.00	26.00	26.00	26.00
August	31.00	25.00	27.00	26.00	26.00	26.00
September	31.00	25.00	27.00	26.00	26.00	26.00
October	31.00	25.00	27.00	26.00	26.00	26.00
November	31.00	24.40	27.00	26.00	26.00	26.00
December	31.00	24.00	27.00	26.00	26.00	26.00
Average	31.00	25.35	25.50	26.21	26.00	26.00

	1937	1938	1939	1940		1946
January	$26.00	$33.00	$28.00	$32.00		$36.00
February	26.00	33.00	28.00	32.00		36.00
March	28.40	33.00	28.00	32.00	1945	36.00
April	30.00	33.00	28.00	32.00	1944	36.00
May	32.25	33.00	28.00	32.00	1943	36.00
June	33.00	33.00	28.00	34.40	1942	36.00
July	33.00	28.00	28.00	36.00	1941 price	36.00
August	33.00	28.00	28.00	36.00	fixed	36.00
September	33.00	28.00	31.00	36.00	at	36.00
October	33.00	28.00	32.00	36.00	$36.00	36.00
November	33.00	28.00	32.00	36.00		38.00
December	33.00	28.00	32.00	36.00		40.00
Average	31.14	30.50	29.25	34.20		36.50

Cast Iron Pipe at New York

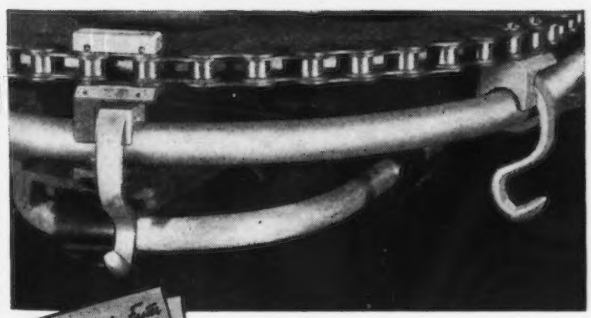
(net ton, 6-in. and larger)

	1929	1931	1932	1933	1934	1935
January	$39.60	$37.90	$30.20	$35.20	$43.00	$45.00
February	39.35	37.90	29.70	35.30	43.00	45.00
March	38.60	37.90	28.40	35.30	43.00	45.00
April	37.40	35.40	28.20	35.30	43.00	45.00
May	35.85	34.15	28.20	35.30	43.00	45.00
June	35.10	33.70	28.20	38.30	44.00	45.15
July	33.20	32.90	28.73	38.30	45.00	45.20
August	33.60	32.90	31.10	38.30	45.00	45.20
September	33.60	32.90	31.30	38.30	45.00	45.20
October	34.60	32.90	33.30	38.00	45.00	45.20
November	34.60	32.90	33.30	43.00	45.00	45.20
December	34.60	32.50	34.30	43.00	45.00	45.20
Average	35.84	34.50	30.41	37.81	44.08	45.11

	1936	1937	1938	1939		1948
January	$45.20	$48.00	$53.00	$49.00		$57.20
February	45.20	48.00	53.00	49.00	1945	57.20
March	45.20	51.00	53.00	49.00	1944	60.20
April	45.20	53.00	53.00	49.00	1943	62.20
May	45.20	53.00	53.00	49.00	1942	62.20
June	45.20	53.00	52.20	49.00	1941	62.20
July	45.90	53.00	49.00	49.00	1940 price	69.60
August	45.90	53.00	49.00	49.00	fixed	69.60
September	45.90	53.00	49.00	49.00	at	69.60
October	45.90	53.00	49.00	52.20	$52.20	69.60
November	45.90	53.00	49.00	52.20		69.60
December	47.90	53.00	49.00	52.20		73.60
Average	45.71	52.00	50.93	49.80		65.23

The Udylite Semiautomatic Plating Machine with one operator who merely loads and unloads the racks will turn out as much work in a given time as a battery of still tanks with a number of operators. And it doesn't require a skilled operator either.

Specifically here's what this machine will contribute to your plating operation.



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1. **Provides greater production.**
2. **Greater process control and therefore greater product uniformity.**
3. **Greater flexibility to meet emergencies.**
4. **Significant economies in man-hours, floor space, time and metal consumption.**

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DETROIT 11, MICHIGAN

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LOGAN CO., INC., 545 CABEL ST., LOUISVILLE 6, KY.

PRICES AND PRODUCTION

Furnace Coke, Connellsville
(net ton at oven)

	1929	1936	1937	1938	1939	1940
January	$2.75	$3.65	$4.00	$4.00	$3.75	$4.20
February	2.90	3.65	4.06	4.00	3.75	4.00
March	2.98	3.65	4.25	4.00	3.75	4.00
April	2.78	3.65	4.51	4.00	3.75	4.00
May	2.75	3.65	4.60	4.00	3.75	4.00
June	2.75	3.65	4.58	3.85	3.75	4.00
July	2.75	3.50	4.35	3.75	3.75	4.20
August	2.73	3.61	4.35	3.75	3.75	4.63
September	2.65	3.69	4.27	3.75	4.25	4.75
October	2.65	3.75	4.25	3.75	4.90	4.75
November	2.65	3.75	4.25	3.75	5.00	5.10
December	2.63	3.92	4.00	3.75	5.00	5.38
Average	2.75	3.68	4.29	3.88	4.09	4.42

	1941	1942	1943	1944	1945	1946
January	$5.50	$6.13	$6.00	$7.00	$7.00	$7.50
February	5.50	6.00	6.25	7.00	7.00	7.50
March	5.52	6.00	6.50	7.00	7.00	7.50
April	5.63	6.00	6.50	7.00	7.00	7.50
May	6.00	6.00	6.50	7.00	7.15	7.50
June	6.13	6.00	6.50	7.00	7.50	7.50
July	6.13	6.00	6.50	7.00	7.50	8.50
August	6.13	6.00	6.50	7.00	7.50	8.75
September	6.13	6.00	6.50	7.00	7.50	8.75
October	6.13	6.00	6.50	7.00	7.50	8.75
November	6.13	6.00	6.50	7.00	7.50	8.75
December	6.13	6.00	6.60	7.00	7.50	8.75
Average	5.92	6.01	6.45	7.00	7.30	8.10

Foundry Coke, Connellsville
(net ton at oven)

	1929	1936	1937	1938	1939	1940
January	$3.75	$4.25	$4.50	$5.00	$4.75	$5.50
February	3.75	4.25	4.50	5.00	4.75	5.31
March	3.75	4.25	4.50	5.00	4.75	5.25
April	3.75	4.25	5.00	5.00	4.75	5.25
May	3.75	4.25	5.25	5.00	4.75	5.25
June	3.75	4.25	5.25	4.85	4.75	5.25
July	3.75	4.00	5.00	4.75	4.75	5.25
August	3.75	4.00	5.00	4.75	4.75	5.25
September	3.75	4.05	5.00	4.75	5.12	5.25
October	3.75	4.25	5.00	4.75	5.65	5.25
November	3.75	4.25	5.00	4.75	5.75	5.88
December	3.50	4.40	5.00	4.75	5.75	5.75
Average	3.73	4.20	4.92	4.86	5.02	5.35

	1941	1942	1943	1944	1945	1946
January	$5.75	$6.88	$6.88	$8.06	$8.25	$9.00
February	5.75	6.88	7.13	8.25	8.25	9.00
March	5.85	6.88	7.38	8.25	8.25	9.00
April	5.62	6.88	7.38	8.25	8.25	9.00
May	6.72	6.88	7.44	8.25	8.47	9.00
June	6.88	6.88	7.50	8.25	9.00	9.00
July	6.88	6.88	7.50	8.25	9.00	9.68
August	6.88	6.88	7.50	8.25	9.00	8.50
September	6.88	6.88	7.50	8.25	9.00	8.50
October	6.88	6.88	7.50	8.25	9.00	8.50
November	6.88	6.88	7.50	8.25	9.00	8.50
December	6.88	6.88	7.50	8.25	9.00	8.50
Average	6.49	6.88	7.39	8.24	8.71	8.85

10,000 Trade Names

(CONTINUED FROM PAGE 175)

Aeralloy: Electrical contact materials. H. A. Wilson & Co., 105 Chestnut St., Newark, N. J.

Aerisweld: Arc-welding electrode to weld copper and bronze. Lincoln Electric Co., 12818 Coit Rd., Cleveland 1.

Aero: Air dryers for sandblasting operations. Niagara Blower Co., 6 E. 45th St., New York 17.

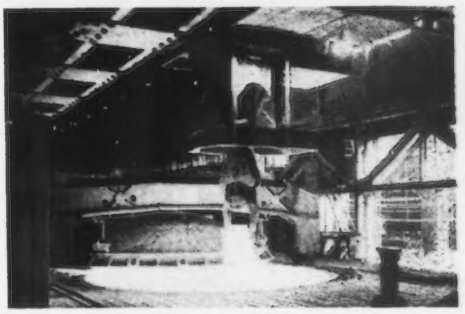
Aero: Chucks. Hannifin Mfg. Co., 623 S. Kolmar Ave., Chicago.

Aero: Screw-thread system. Aircraft Screw Products Co., Inc., 47-23 35th St., Long Island City, N. Y.

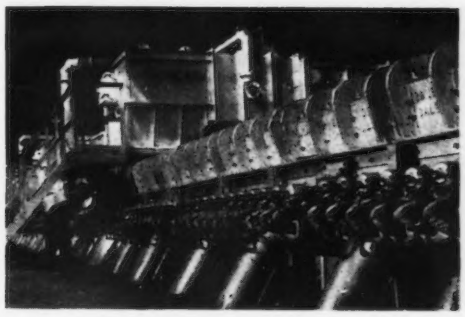
Aerocarb: Carburizing compound. American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20.

WHAT SALEM DOES IN THE METAL WORKING INDUSTRIES

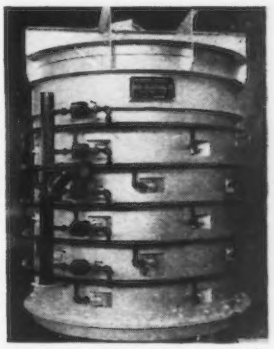
Salem Rotary Hearth furnaces are used for heating steel and copper for seamless tube mills and merchant mills . . . for heating copper billets for wire mills and ingots for making wheels . . . and for annealing fish plates.



Salem Circular Pits are used for heating all types of ingots . . . fired by natural gas, coke oven gas, combinations of blast furnace and coke oven gases, and coke oven gas and oil.



All the butt-weld furnaces in the United States and Canada **have been built by Salem.**



This hood type annealing furnace, **made by Salem Engineering Company,** is used by ferrous and non-ferrous industries . . . electric or gas fired.

Salem Builds

CIRCULAR SOAKING PITS
ROTARY HEARTH FURNACES
CONTINUOUS BUTT-WELD FURNACES
CAR BOTTOM FURNACES
FORGE FURNACES
HEAT TREATING FURNACES
NEEDLE METALLIC RECUPERATORS
AIR RECIRCULATING FURNACES
GAS ATMOSPHERE FURNACES
MECHANICAL EQUIPMENT FOR CHARGING AND DISCHARGING MATERIAL FROM FURNACES

Steel Plant Engineers

SALEM ENGINEERING COMPANY

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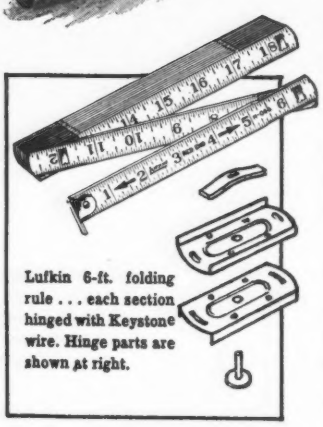
KEYSTONE WIRE

Every Lufkin folding rule has an extremely accurate hinge joint that keeps the rule in perfect alignment. Open a 6-ft. Lufkin "Red End" rule to its full length and then sight down the edge. You'll find it as straight as a plumb-line —and built to stay that way through years of hard use.



Lufkin 6-ft. folding rule . . . each section hinged with Keystone wire. Hinge parts are shown at right.

The heart of this precision-made joint is the sturdy tubular hinge rivet, made of specially-drawn Keystone wire . . . wire that must be uniform to within extremely close tolerances, ductile for proper fabrication, yet tough and springy to withstand tension and wear.

We are pleased that Keystone wire meets all these qualifications, helping keep the Lufkin rule a leader in its field. Whatever the wire need, Keystone can normally supply it.

*Lufkin Rule Co., Saginaw, Michigan

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KEYSTONE STEEL & WIRE CO. PEORIA, ILLINOIS

SPECIAL ANALYSIS WIRE for all industrial purposes

KEYSTONE STEEL & WIRE COMPANY
PEORIA 7, ILLINOIS

10,000 TRADE NAMES

Aerocarb Deepcase: Liquid-bath carburizer; barium-base activated cyanide, featuring chemical stability, rapidity of case penetration and case uniformity; for carburizing steel at 1700° to 1750°F to produce cases up to 0.150 in. deep. American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20.

Aerocrete: Cellular expanded cement, through addition of aluminum powder, limestone dust, other ingredients. Aerocrete Western Corp., 737 N. Michigan, Chicago.

Aerocase: Case-hardening compounds. American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20.

Aerodyne: Fans. Jeffrey Manufacturing Co., 906-99 N. Fourth St., Columbus 16, Ohio.

Aerofelt: Duct insulation. Johns-Manville, 24 E. 40th St., New York 16.

Aeroheat: Salt bath for hardening steel. American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20.

Aeron: Aluminum alloy with Cu-Si-Mn, for light-alloy parts. Metallbank A.G., Heddernheim, Germany.

Aeroquip: Self-sealing coupling which permits separation and reconnection of fluid carrying lines without loss of fluid of inclusion of air into system; flexible hose assemblies. Aeroquip Corp., 300 S. East Ave., Jackson, Mich.

Aeroquip X-Washer: Combination washer and locking device. Aeroquip Corp., 300 S. East Ave., Jackson, Mich.

Aero-Seal: Series of hose clamps. Easy to use, very strong, and reusable. Aircraft Standard Parts Co., 1711 19th Ave., Rockford, Ill.

Aerosol: Wetting agent. American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York 20.

Aero-Thread: Inserts, screws, tools and gages for assembly and installation, high-strength screw fasteners in ferrous and nonferrous material for increasing fatigue resistance of conventionally threaded assemblies. Aircraft Screw Products Co., Inc., 47-23 35th St., Long Island City, N. Y.

Aertite: Boiler wall coating. Johns-Manville, 24 E. 40th St., New York 16.

Adamantine: Low-alloy carbon steel for grinding mills balls. Babcock & Wilcox Co., Barberton, Ohio.

Admiralty Brass: 62-37 brass with 1 Sn for pump rods and sheets. American Brass Co., Waterbury, Conn.

Admiralty Bronze: 88 Cu, 10 Sn, 2 Zn sand-cast alloy for gears, worms and trolley wheels. American Brass Co., Waterbury, Conn.

Admiralty Metal: A 70-29 brass with 0.9 Sn for condenser tubes and head plates. Chase Brass & Copper Co., Inc., Waterbury, Conn.; American Brass Co., Waterbury, Conn.

Admiro: Stainless alloy with 48 Cu, 35 Zn, 10 Ni for turbine bearings and tubes. Allgemeines Deutsches Metallwerk, G.m.b.H., Berlin, Germany.

Admos: Corrosion and erosion resistant Cu-Zn alloy with Ni and Mn for bearing bushes, condenser tubes, worm wheels and valves. Allgemeines Deutsches Metallwerk, G.m.b.H., Berlin, Germany.

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Floor space for expanding manufacturing operations as well as added storage space can be increased by overhead material handling with Northern Hoists and Overhead Cranes.

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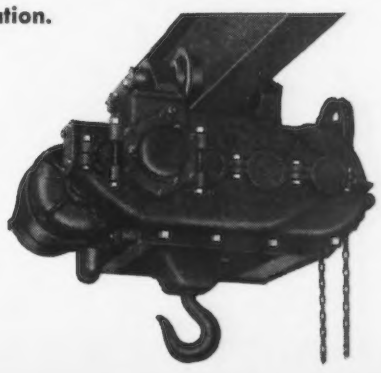

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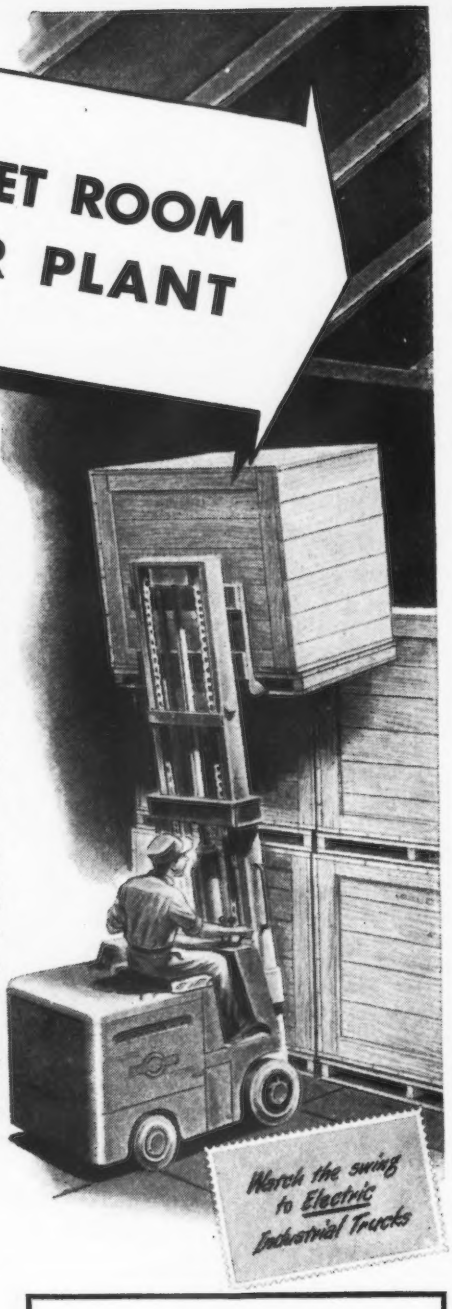
THE SECRET ROOM IN YOUR PLANT



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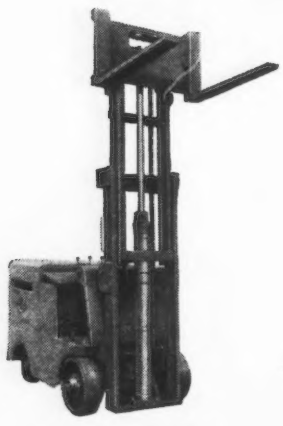

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10,000 TRADE NAMES

Adnic: High-copper nickel alloy for condenser tubes and auto head lights. Scovill Mfg. Co., Waterbury, Conn.

Advance: An alloy of copper and nickel for electrical instrument work and rheostats. Driver-Harris Co., Harrison, N. J.

Aeron: 4.5 Cu alloy for light anti-corrosive parts. Degefors Iron & Steel Works, Degefors, Sweden.

Aetna: Ball bearings. Aetna Ball Bearing Mfg. Co., 4612 Schubert Ave., Chicago.

Aetna: Firebrick. Aetna Fire Brick Co., Oak Hill, Ohio.

Aetna: Solder and hard lead. Aetna Smelting & Refining Works, 13 Centre St., Jersey City, N. J.

Agaloy: Seamless, welded, brazed tubing of stainless and carbon steels, nickel alloys and bimetals up to 4 in. od. Agaloy Tubing Co., Elizabeth 3, N. J.

Agathon: Fe-Si alloys for armature and dynamo applications. Republic Steel Corp., Republic Bldg., Cleveland.

Agile: Fe alloy with 1.5 W, 0.9 C, 0.7 Mn, 0.7 Cr used for welding electrodes. American Agile Corp., 5806 Hough, Cleveland.

Agile Silver Black: High-speed steel with 8 W, 1.5 Be for welding high speed steel cutters. American Agile Corp., 5806 Hough, Cleveland.

Agile Yellow Rod: Alloy of 67 Ni, 31 Cu and 0.2 B for welding, electrode for cast iron. American Agile Corp., 5806 Hough, Cleveland.

Agnew: Welding equipment. Agnew Electric Co., 1940 Thomas St., Milford, Mich.

Agricola: 70-30 Cu-Pb for diesel engine bearings, seals. Fredericksen Co., South Water at Agricola, Saginaw, Mich.

Agrilite: Self-lubricating bearing bronzes with 70 Cu, 5 Sn, 25 Pb for connecting rod bearings, rolling mill and thrust bearings. American Injector Co., 1485 14th Ave., Detroit.

Aidion: Anti-friction metal. John Finn Metal Works, 384 2nd, San Francisco.

Aimco: Insulating and wire covering machinery. American Insulating Machinery Co., Fairhill & Huntingdon, Philadelphia.

Air-A-Way: Bond furnace cement. Seaboard Refractories Co., Perth Amboy, N. J.

Air-Bloc: Industrial hoists. Ingersoll-Rand Co., 13 Broadway, New York 4.

Air-O-Line: Controllers. Brown Instrument Co., 4498 Wayne Ave., Philadelphia 44.

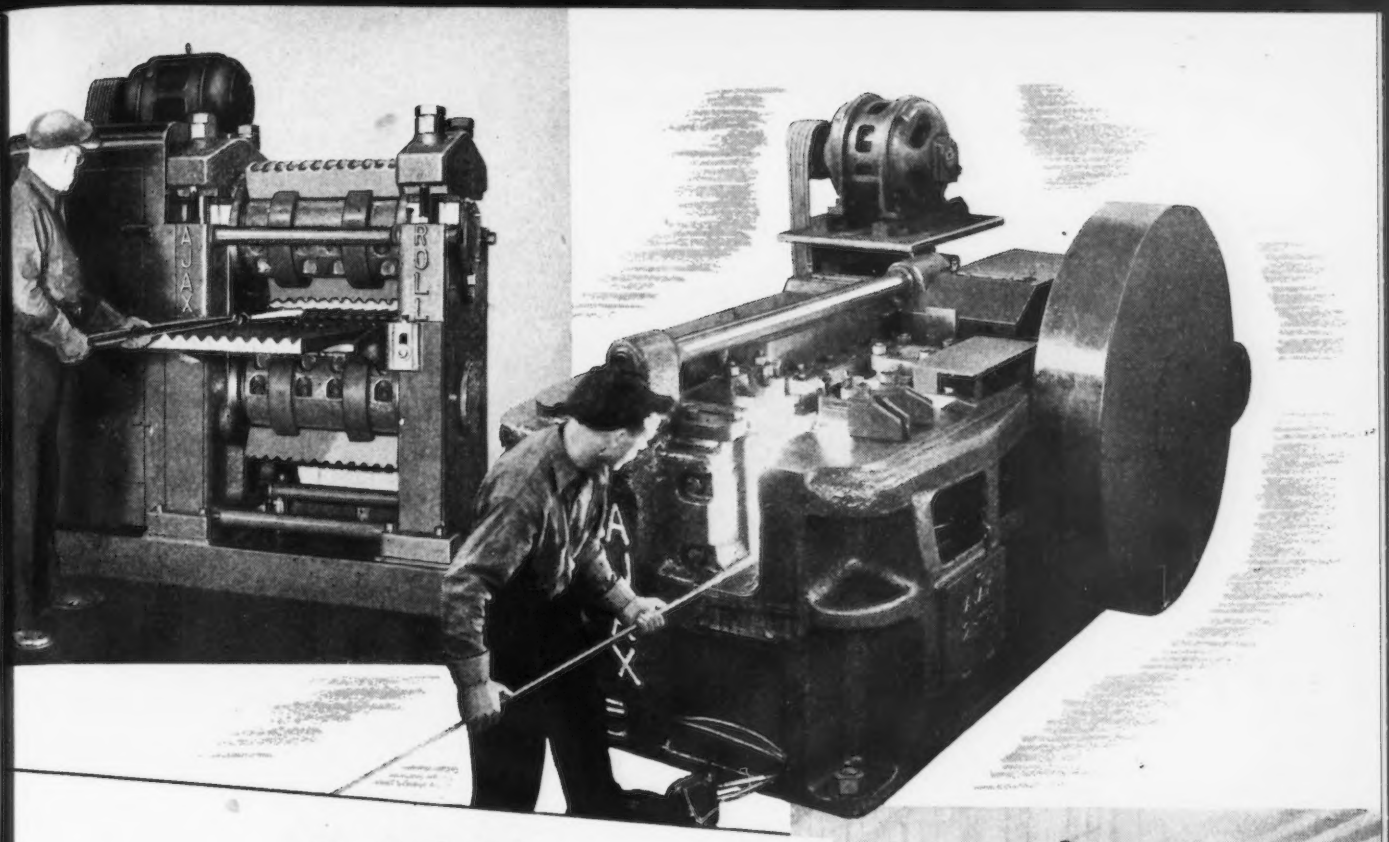
Airam: Clay brick. General Refractories Co., 111 S. Broad, Philadelphia.

Airco: Oxygen, acetylene, oxyacetylene cutting and welding equipment; stationary and mobile cutting machines, with multiple torches and manual, magnetic or electronic tracing devices. Air Reduction Co., Inc., 60 E. 42nd St., New York 17.

Airco: Welding rod. Wilson Welder and Metals Co., 60 E. 42 St., New York.

Aircord: Aircraft cable of superior fatigue life and decreased stretch. John A. Roebling's & Sons Co., Trenton 2, N. J.

Air Cylinders: Cushioned or noncushioned,



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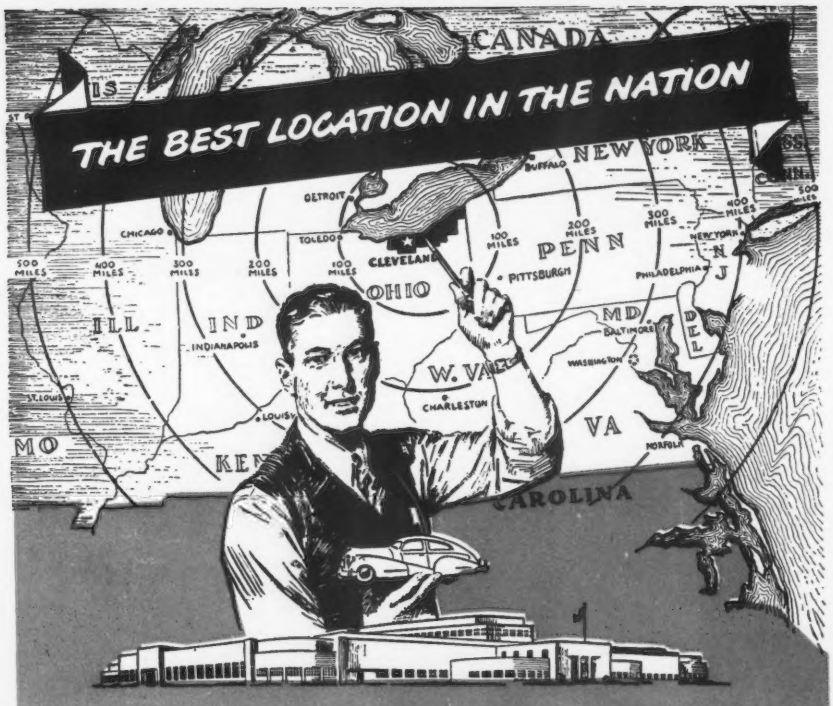

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nonrotating, single or double acting; valves and accessories. Pneumatics, Inc., Plymouth, Ind.

Airex: Fans and blowers. Mountain States Equipment Co., Denver.

Airflex: Flexible coupling. Falk Corp., 3027 W. Canal St., Milwaukee.

Airflo: Spray painting outfits. Crown Spray Gun Mfg. Co., 1214 Venice Blvd., Los Angeles.

Airgrit: Process of stenciling as incorporated in Matthews Airgrit Machine. Unlimited in its application for marking. Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13.

Air-Horse: Rotary file and die grinder. Ideal Industries, Inc., Sycamore, Ill.

Air-Lec: Automatic door opening and closing devices. Schoelkopf Mfg. Co., 312 N. Third St., Madison 4, Wis.

Airline: Acid-core solder. Gardiner Metal Co., 4838 S. Campbell Ave., Chicago.

Airline: Air-motor grease guns. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis.

Airline Tools: Milling cutters, special tools, rotary knives. Cowles Tool Co., 2086 W. 110th St., Cleveland 2.

Airloin 81-V: Immersion cleaner for aluminum. Turco Products, Inc., Los Angeles 54.

Airlox: Air-operated vises and hydraulically operated vises; hydraulic and pneumatic precision production vises, air cylinders and valves. Production Devices, Inc., Whitehall, N. Y.

Air-O-Limit: Gages. Pratt & Whitney Div. of Niles-Bement-Pond Co., Charter Oak Park, West Hartford, Conn.

Air-O-Line: Fuel-flow control systems for furnaces. Brown Instrument Co., 4490 Wayne Ave., Philadelphia.

Airolite: Heat-resisting metal. National Airoil Burner Co., Inc., 1240 E. Sedgley Ave., Philadelphia 24.

Airset: High-temperature cement. John J. Moroney & Co., 2825 W. Harrison, Chicago.

Airstream: Centrifugal blower wheels, forward curved multi-blade, for manufacturers of air conditioning equipment, forced warm air furnaces, evaporative coolers. Morrison Products, Inc., 16816 Waterloo Rd., Cleveland 10.

Air-Tracer: Device for stepless increasing contours in lathes. Monarch Machine Tool Co., Sidney, Ohio

Airway: Ventilated buffing wheels. Jackson Buff Corp., 24-01 41st, Long Island City, N. Y.

Air-Way: Pumps and parts Air-Way Pump & Equipment Co., 571 W. Van Buren, Chicago.

Ajax: Blacking for foundries. J. S. McCormick Co., 42 25th St., Pittsburgh.

Ajax: Conveyor belting. Hewitt Rubber Corp., Central & Kensington Aves., Buffalo.

Ajax: Cutting compounds. Phoenix Oil Co., 9505 Cassius Ave., Cleveland.

Ajax: Electric arc welders. Railway Track-

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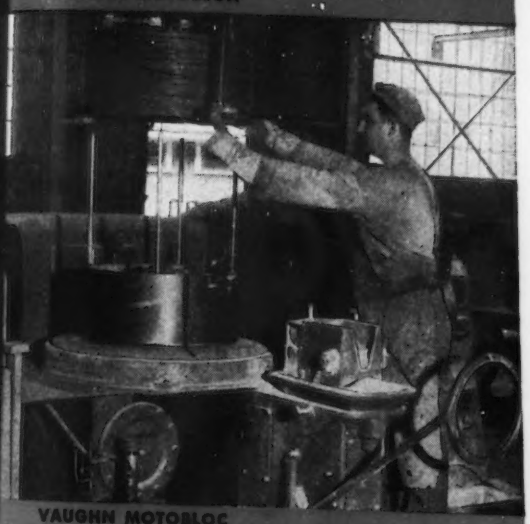
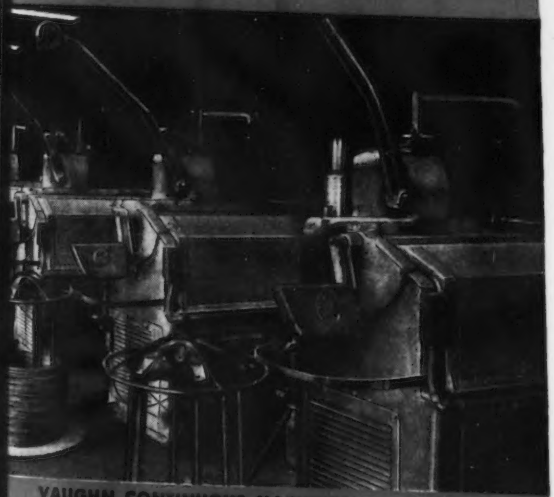


VAUGHN MOTOBLOC



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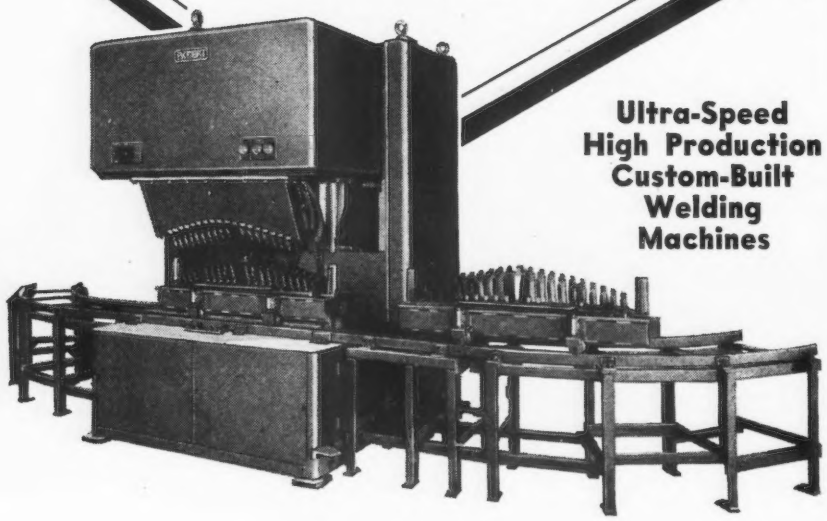

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Work Co., Thompson & Clementine, Philadelphia.

Ajax: Electric furnaces and supplies marketed by Ajax Metal Co., Ajax Electric Furnace Co., Ajax Electric Co., all of Philadelphia; and Ajax Electrothermic Corp. and Ajax Engineering Corp., Trenton, N. J.

Ajax: Fire-clay brick. Chicago Retort & Fire Brick Co., 206 So. La Salle, Chicago.

Ajax: Top quality rubber products for general service. Hewitt Rubber Corp., Buffalo 5.

Ajax-Hultgren: Electric salt bath furnaces utilizing the internal heating principle of immersed electrodes. Ajax Electric Co., Inc., Frankford and Delaware Aves., Philadelphia 23.

Ajax "Navy" Tombasil: 91 Cu, 4.5 Si, 4.5 Zn, silicon "bronze" casting alloy for large or small castings of sound, homogeneous structure, high strength and corrosion resistance. Ajax Metal Co., 52 Richmond St., Philadelphia 23.

Ajax-Northrup: High-frequency induction furnaces for melting, heating, hardening, surface hardening, etc. Ajax Electrothermic Corp., Trenton, N. J.

Akon: Boiler feedwater treatment to prevent scale, carryover and corrosion. Allis Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1.

Aktiv: Cement floor cleaner and bleach. Turco Products, Inc., Los Angeles 54.

Akratex: Castings. Whip-Mix Corp., Louisville.

Akros: Varnishes, paints, enamels, etc. Akron Paint & Varnish Co., Akron, Ohio.

Akuret: Thickness gages. Kastar, Inc., 34 W. 14th St., New York.

Alabrase: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Aladdin: Zinc base welding rod for welding white metal, soldering and brazing aluminum. Aladdin Rod & Flux Mfg. Co., P. O. Box 935 Madison Square Station, Grand Rapids.

Alaka: Metal finishes, Lacquer & Chemical Corp., 214 Fortieth St., Brooklyn.

Alamo: Centrifugal pumps, rotary, benders, bulldozers, alligator shears, spiral hooping machines, pipe straighteners, core-sand conditioners, mule pumps. Alamo Iron Works, 120 Hoefgen, San Antonio, Tex.

Alamo: Low-alloyed Mn-Al-Mo steel for nitrided parts. Birmabright Ltd., Birmingham, England.

Alamo: Super-duty fireclay brick. Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh.

Alakron: Corrosion-resistant aluminum alloy with Si, for decorative castings. William Mills & Co., Birmingham, England.

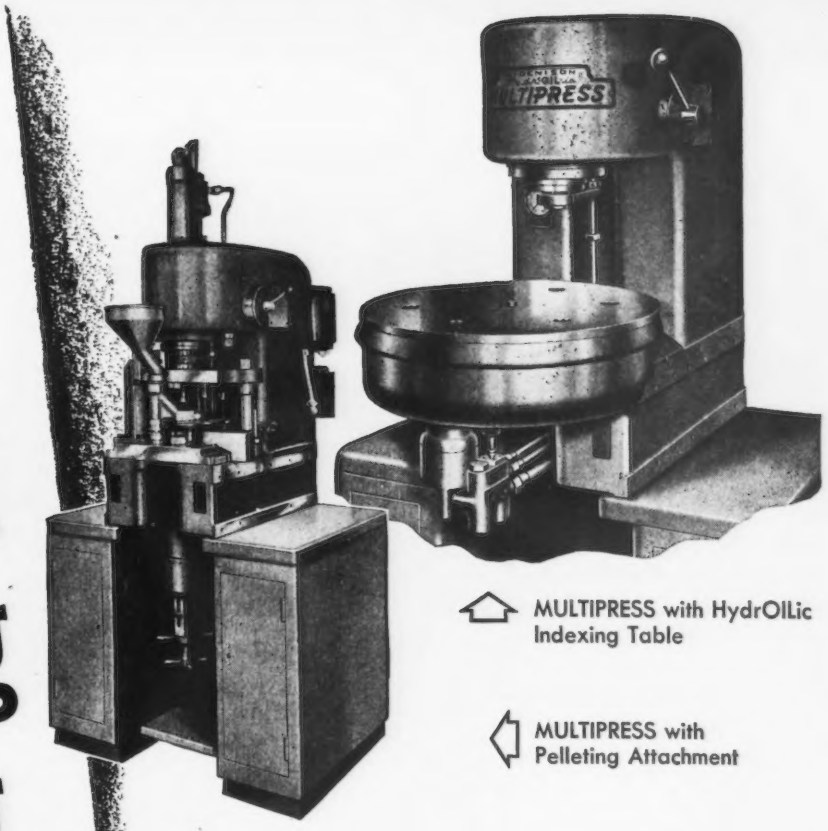
Alba: Corrosion-resistant alloys of 30 Pd, 60 Ag, 5 Au and other elements; for fountain pen points, dental industry and as solder. Heraeus-Vacuumschmelze A.G., Hanau, Germany.

Albaloy: Alloy-plating process. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Albanoid: Brass with 20 Ni for architectural and sanitary cast fittings. Henry Wiggin & Co., Ltd., Birmingham, England.

Albany: Sand slinger for loading box cars.

Blanking Forming Pelleting Shearing Marking Assembling with MULTIPRESS



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MULTIPRESS with Pelleting Attachment

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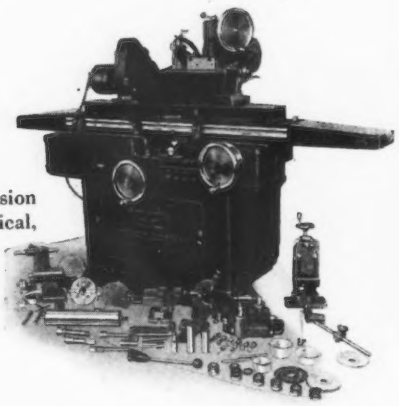
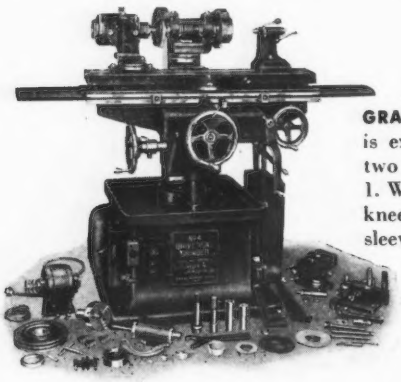
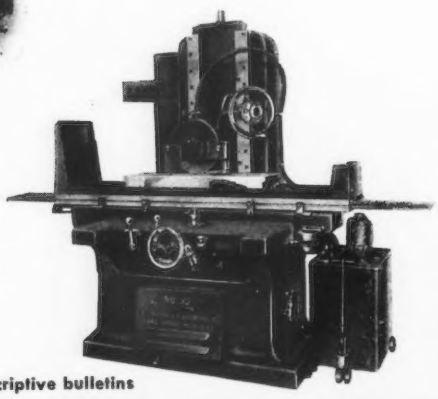


GRAND RAPIDS NO. 80 HYDRAULIC FEED UNIVERSAL AND TOOL GRINDER is a precision grinder which handles: Surface, Cylindrical, Internal, Cutter, Face, Periphery, Corner Form Cutter, Spiral Milling Cutter, Reamer, Hob, Gear Cutter, Radius and Internal.



GRAND RAPIDS NO. 4 UNIVERSAL GRINDER is extremely flexible in operation, permitting two ways of performing nearly every operation: 1. With the spindle head locked, the sleeve and knee swivel around the column; 2. With the sleeve locked, the head swivels on the column.



GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER offers *Faster Precision Production*—125 feet per minute longitudinal table speed. Table travel and cross feed are automatic. Wheelhead powered for rapid vertical travel. Automatic and powered movements cut the operator's effort to a minimum.

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10,000 TRADE NAMES

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Albondur: Corrosion resistant aluminum alloy with aluminum coating for light-alloy parts. Vereinigte Leichtmetall Werke, G.m.b.H., Hanover-Linden, Germany.

Albral: Foundry compound for aluminum, manganese and silicon bronzes. Foundry Services, Inc., 278 Madison Ave., New York.

Albro: Corrosion-resistant alloy for special castings. Bronze Die Casting Co., 1836 N. Franklin St., Pittsburgh.

Albron: Paint pigments, particularly aluminum-bronze powder. Aluminum Co. of America, Oliver Bldg., Pittsburgh.

Albuco: Lubricating oils and greases. American Lubricants Co., Dayton, Ohio.

Alcarb: Fluid for case hardening. Ecco Chemical Corp., Weehawken, N. J.

Alchrome: Cr-Al iron alloy for electrical resistors and heating elements. Wilbur B. Driver Co., Newark, N. J.

Alchrome 6 and 3: 83 Fe, 20 to 14 Cr, 6 to 3 Al, nickel-free alloys used as wire and ribbon for toasters, hot plates and electric appliances. Wilbur B. Driver Co., 161 Riverside Drive, Newark 4, N. J.

Alco: Industrial finishes. Alston-Lucas Paint Co., Lyons, Ill.

Alcoa: All types of aluminum and aluminum-alloy ingots, castings, forgings, shingles, corrugated roofing, down-spouts, tubing, rivets, nails, welding flux, collapsible tubes, cables, lithograph plates, foil, extruded shapes, solder, caps and closures, sheets, strip, etc. Aluminum Co. of America, Oliver Bldg., Pittsburgh.

Alconite: Castings. Fairmount Foundry, Inc., 3rd & Westmoreland, Philadelphia.

Alcop Bronze: Brass with 2.5 Al for centrifugal castings, bushings, liners, bearing cages. Janney Cylinder Co., 8037 Frankford Ave., Philadelphia.

Alcor: High-alumina brick. Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh.

Alcrosil: Corrosion resistant, highly alloyed steel. Timken Steel & Tube Co., Canton, Ohio.

Alculoy: High-copper aluminum alloy with Si-Fe-Zn, for die castings. Doehler Die Casting Co., 384 Fourth Ave., New York 16.

Alcumite: Fatigue and wear-resistant copper-aluminum alloys for blowers, pumps and pickling baskets. Duriron Co., Inc., Scott & Spofford Sts., Dayton.

Alcumite: Aluminum-bronze corrosion-resisting alloy. Duriron Co., Inc., Dayton 1.

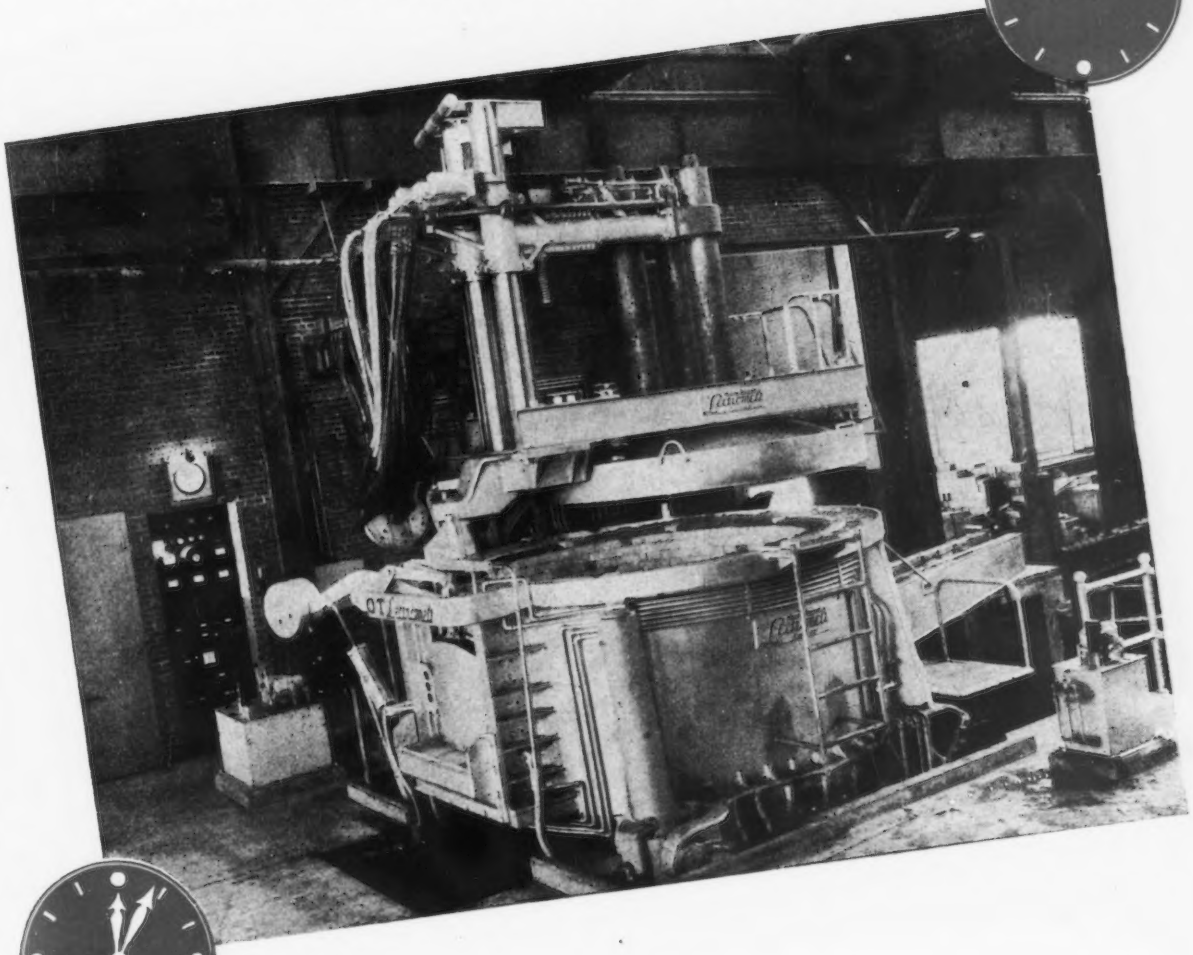
Alcunic: Corrosion-resistant high-copper alloys for condenser tubing. Scovill Mfg. Co., Waterbury, Conn.

Alda: Copper coated welding rods. British Oxygen Co., Ltd., London, England.

Aldal: Duralumin-type aluminum alloy with Cu-Mn-Mg; for light-alloy parts, aircraft applications. Societe du Duralumin, Paris, France.

Aldrey: Wrought aluminum alloy with Si, Mg, Fe for automotive engines and electric

MORE TONS PER TURN



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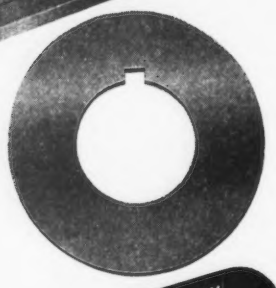

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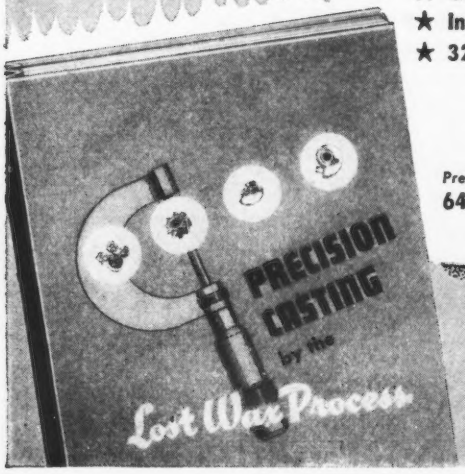

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transmission wires. Aluminum Industrie Aktiengesellschaft, Neuhausen, Switzerland.

Aldrich: Descaling nozzles. Aldrich Pump Co., 1 Pine St., Allentown, Pa.

Aldrich-Weir: Pumps. Aldrich Pump Co., 7 Pine St., Allentown, Pa.

Aldurbra: A corrosion-resistant 76-22 brass with 2 Al for condenser tubes. Chas. Clifford & Son, Ltd. Birmingham, England; Imperial Chemical Industries, Ltd., Birmingham, England.

Alemite: Special diecasting alloy. Alemite Die Casting & Mfg. Co., 1st & Clay Sts., Woodstock, Ill.

Al-Ex: Brilliant aluminum paint. Studebaker Chemical Co., Elyria, Ohio.

Alferium: Aluminum alloy with 4 Cu, Mn-Mg, for airplane parts. Schneider & Cie, Paris, France.

Al-Tin: Aluminum alloys bonded to ferrous metals and alloys. Fairchild Engine & Airplane Corp., 21 41st Ave., Long Island City, N. Y.

Alfite: Carbon-dioxide gas used for fire extinguishers. American - LaFrance - Foamite Corp., Elmira, N. Y.

Alfrax: Electrically - fused aluminum-oxide super refractories for thin walled muffles and in retorts, hearths, piers, pier walls and burner blocks. Carborundum Co., Refractories Div., Perth Amboy, N. J.

Alkacite: Acid and alkali-resistant coatings. Protective Coatings, Inc., Box 56R, Strathmoor Sta., Detroit.

Alkali Rust Inhibitor: 14 oz of X material to 100 gal of water for steel protection prior to lacquering. Diamond Alkali Co., Oliver Bldg., Pittsburgh 22.

Alkalon: Alkali-proof paint. Heil Engineering Co., 12000 Elmwood Ave., Cleveland.

Alkalume: Cleaning materials for aluminum, magnesium, etc. Northwest Chemical Co., 9300 Roselawn Ave., Detroit.

All American: Vibration, fatigue testing equipment. All American Tool & Mfg. Co., 1016 Fullerton Ave., Chicago 14.

All-Angle: Milling machines which can be run at any angle in either or both the vertical or horizontal planes; also attachments adaptable to all makes of milling machines, lathes, planers, boring mills, etc., to enable operation at any angle or compound angle vertical or horizontal. Fray Machine Tool Co., 515 Windsor Rd., Glendale 4, Calif.

Allan: Red metal piston facings, bearing metal. A. Allan & Son, 604 Bergen St., Harrison, N. J.

Allan Cunningham: Hoists and winches. Markey Machinery Co., 87 Horton St., Seattle.

Allan Red Metal: Lead and copper mechanical mixture for bearings, crank pins. A. Allan & Son, 606 Bergen St., Harrison, N. J.

Allatonce: Soldering machinery. P. E. Chapman Elec. Wks., 1822 Chouteau Ave., St. Louis.

Allautal: Similar to Alclad, for light-alloy parts. Vereinigte Leichtmetall Werke, G.m. b.H., Hanover-Linden, Germany.

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Allegheny Metal: All types of stainless steel. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh.

Allen: Aluminum flux and solder. L. B. Allen Co., Inc., 6759 Bryn Mawr Ave., Chicago.

Allen: Drilling and tapping machines. Chas. G. Allen, Barre, Mass.

Allen: Lead gages. Allen Gauge & Tool Co., 423 N. Braddock Ave., Pittsburgh.

Allen: Pneumatic riveters. Hannifin Mfg. Co., 623 S. Kolmar Ave., Chicago.

Allen: Riveting machines. Allen Riveter, Div. of Hannifin Mfg. Co., 623 S. Kolmar Ave., Chicago.

Allen: Electric test equipment. Allen Electric & Equipment Co., Kalamazoo, Mich.

Allen Alum-Flux: Solder. L. B. Allen Co., Inc., 6759 Bryn Mawr Ave., Chicago.

Allenoy: Nickel bearing steel for set and tap screws. Allen Mfg. Co., Hartford.

All-Geared: Metal drilling and honing machines. Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Allied: Bearing lock nuts. Allied Machine & Engineering Corp., 720 Fair Ave., N. W. New Philadelphia, Ohio.

Alligator: Steel belt lacing, belt cutters, V-belt fasteners. Flexible Steel Lacing Co., 4640 Lexington Ave., Chicago.

Alligator: Wrenches. John A. Roebling's Sons Co., Trenton, N. J.

Alligator Brand: Files. Carson Newton Co., Belleville, N. J.

Alling-Lander: Speed reducers and gears. Alling-Lander Co., 61 Basket St., Sodus, N. Y.

All In-One: Finned copper and aluminum tubing. Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., 1465 Central Ave., Detroit.

Allisite: High strength cast iron. Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1.

Al-Lite: Aluminum safety hoist. Chisholm-Moore Hoist Corp., 5000 Fremont Ave., Tonawanda, N. Y.

Alloy-50 Z: Nickel-chromium alloy of the 35-15 type, and used in cast or rolled form for heat-resistant applications. Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8.

Alloy Gas Welding: 3.5 Ni, Mn, Si alloy steels for acetylene welding electrodes. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Alloyrod: Arcwelding electrodes for steel; corresponds to AWS E-7020 and E-7010. Wilson Welder & Metals Co., 60 E. 42nd St., New York 17.

All Purpose: Punch and chisel sets. Vlchek Tool Co., E. 87th & Koster Sts., Cleveland.

All Purpose: Tool post grinder. R. G. Smith Tool & Mfg. Co., 247 South St., Newark, N. J.

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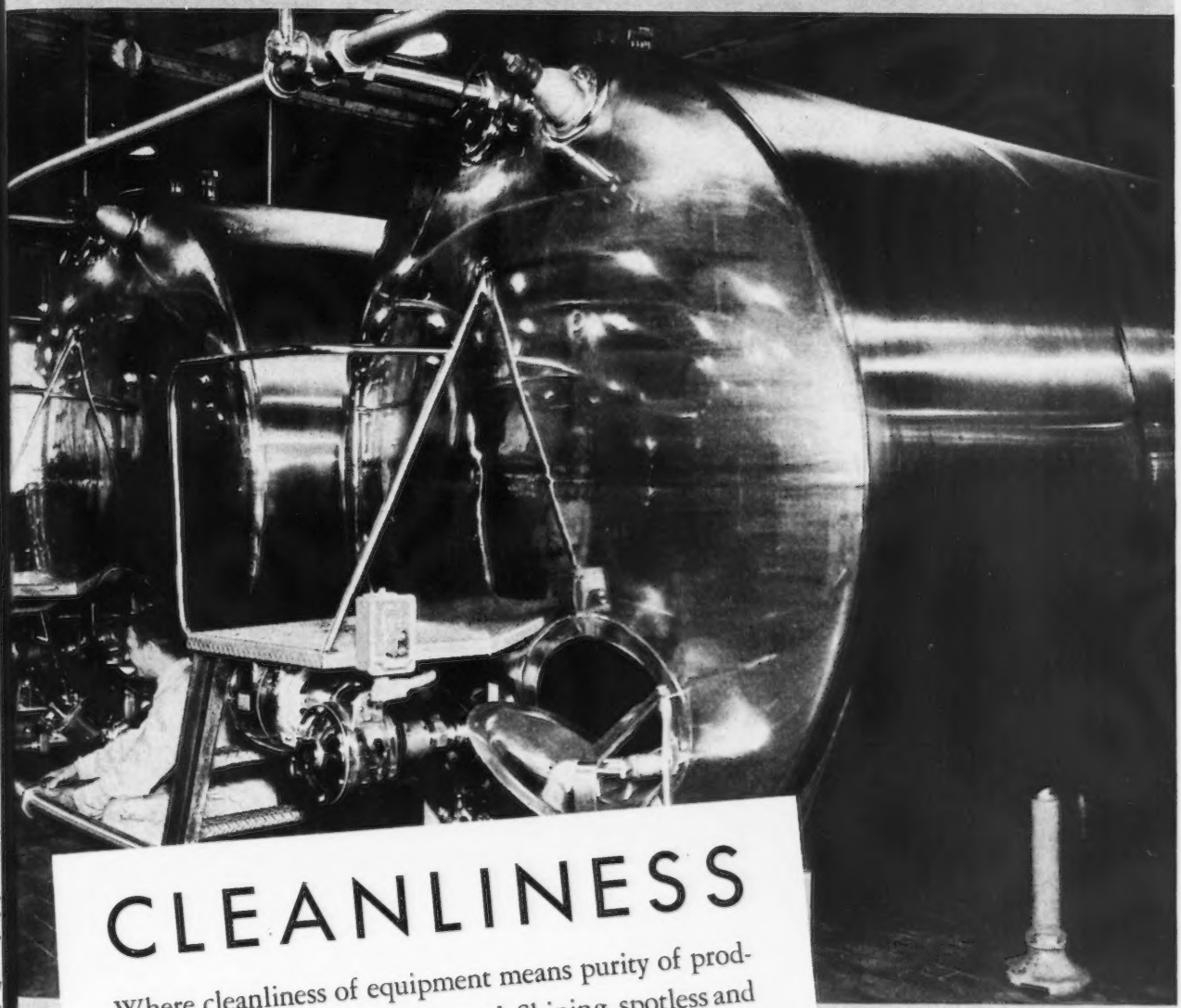
CHROMIUM-NICKEL AUSTENITIC STAINLESS STEELS

Most versatile of modern metals . . . their unique combinations of properties merit your consideration in designing for the future.



CLEANLINESS

Where cleanliness of equipment means purity of product, stainless steels are widely used. Shining, spotless and hygienic, inside and out, these chromium-Nickel stainless steel milk storage tanks guard purity at Sheffield Farms Co., Inc., Division of National Dairy Products Corp., Jamaica, Long Island, N. Y.

International Nickel are miners, smelters, and refiners of Nickel, an important ingredient in the chromium-Nickel austenitic stainless steels. Although they do not produce these stainless steels, a list of the sources of supply will be furnished on request.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

BEATTY MACHINE & MFG. CO. Hammond, Ind.

This Name

ON A MACHINE MEANS-

ADVANCED DESIGN
Keen engineering minds, close to the problems of the metal working industry, can help solve your *problems* with machines that bear the BEATTY name-plate. Talk to BEATTY before you buy.

FINE PERFORMANCE
Matching their modern engineering, are the finest materials, the top quality craftsmanship that goes into the building of BEATTY machines. That name stands for speed, accuracy, durability, low up-keep.

A COMPLETE LINE
Consult us for hydraulic and mechanical punches, presses, shears, pipe benders, bulldozers, coping machines, extrusion presses and spacing tables.

Write—

Write for information on the complete Beatty line of mechanical and hydraulic punches, presses, spacing tables, bulldozers, extruding presses.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

10,000 TRADE NAMES

Allsoft: Renewable face soft hammers. Gregory Tool & Mfg. Co., 5299 Tireman Ave., Detroit.

All-Sol: Stainless steel soldering flux. L. B. Allen Co., Inc., 6759 Bryn Mawr Ave., Chicago.

All-Sol: Soldering flux. Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago 80.

All-Speed: Variable speed transmissions. Standard Transmission Equipment Co., 3400 Verdugo Rd., Los Angeles.

All Steel: Presses. Sigwalt Mfg. Co., 2013 N. Lawndale Ave., Chicago.

All Steel: Steel screw drivers. Billings & Spencer Co., 12 Laurel St., Hartford.

Allway: Compound saws and hacksaw frames. Ultra Mfg. Co., 2082 Boston Rd., New York.

All-Way-Grip: Rolled steel floor plates, with projections to angle instead of vertical axis. Central Iron & Steel Co., Harrisburg, Pa.

All-Weather Control: Bonnet and stack switches used with heat regulators for solid-fuel furnaces. Master Electric Co., Dayton 1.

Almag: Aluminum and magnesium alloys. Aluminum & Magnesium, Inc., Huron & W. Monroe Sts., Sandusky, Ohio.

Almag: Duralumin-type aluminum alloy with Cu-Mn-Mg; for light-alloy parts, aircraft applications. Aluminum Francais, Paris, France.

Almond: Drill and lathe chucks, countershafts. T. R. Almond Mfg. Co., Ashburnham, Mass.

Alneon: Aluminum alloy with Cu and Zn for light alloy parts. E. Strasser, Rohrschach, Switzerland.

Alnico: Series of cast irons with Al-Ni-Co-C-Si for permanent magnets. Crucible Steel Co. of America, 405 Lexington Ave., New York.

Alnico: A group of permanent-magnet alloys containing about 20 Ni, 12 Al, 5 Co, 63 Fe. Very hard and brittle. General Electric Co., Schenectady.

Alnico: 5 to 20 Al, 10 to 45 Ni and Co, balance iron; or 8 to 13 Al, 14 to 25 Ni, 2 to 18 Co, 2 to 16 Cu, balance iron; for small permanent magnets. General Electric Co., Schenectady.

Alniloy: Aluminum alloy with Cu, Ni, and Si used for ornaments. Doehler Die Casting Div., Doehler-Jarvis Corp., Toledo, Ohio.

Alnor: Temperature measuring instruments. Illinois Testing Laboratories Inc., Hubbard & La Salle Sts., Chicago.

Alnor Pyrocon: Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10.

Alodine: Nonelectrolytic chemical process for producing a corrosion-resistant coating on aluminum and aluminum alloys. American Chemical Paint Co., Ambler, Pa.

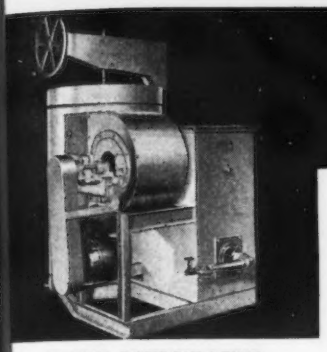
Alorix: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Alowalt: Wheels and abrasives. Waltham Grinding Wheel Co., Waltham, Mass.

Aloy-num: Aluminum alloy for pistons. E. J. Egge Co., 7700 S. Main St., Los Angeles.

Al-Ox: Aluminum-oxide papers and cloths. Clover Mfg. Co., Norwalk, Conn.

Sunbeam STEWART

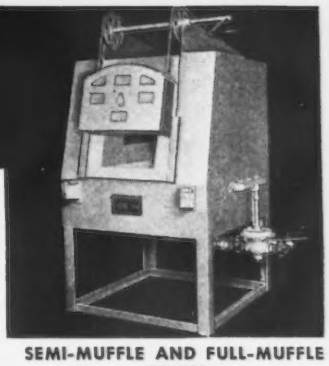


BASKET RECIRCULATING FURNACE

Small tools, dies, or anything small enough to be most conviently handled in batches, can be easily tempered or stressed relieved quickly and uniformly in this Sunbeam Stewart unit.

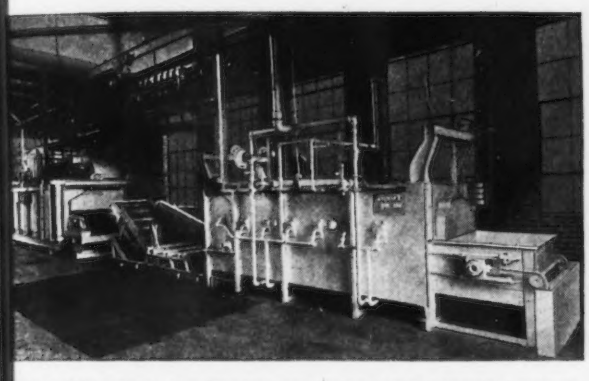
There is a Sunbeam Stewart Industrial Furnace for Every Need

Forging • Carburizing • Case Hardening • Tinning • Normalizing • Brazing • Rod Heating • Lead Hardening • Billet Heating • Oil Tempering • Plate and Angle Heating • Soft Metal Melting • Hardening High Speed Steel • Galvanizing • Stress Relieving • Rivet Heating • Brass Melting • Annealing • Salt Bath Hardening • Cyanide Hardening • Hardening Carbon Steel



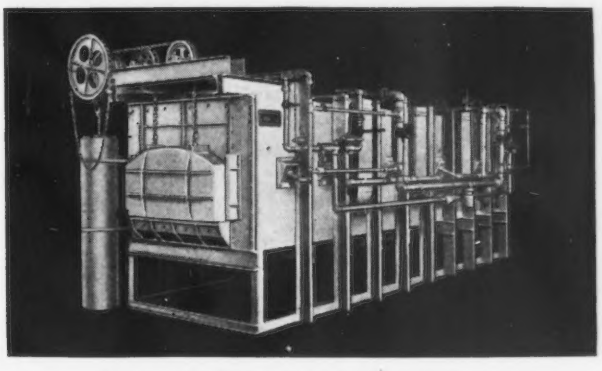
SEMI-MUFFLE AND FULL-MUFFLE OVENS

Where special atmospheres are required, Sunbeam Stewart Semi-muffle and Full-muffle Furnaces (with patented seal-tite door) are recommended.



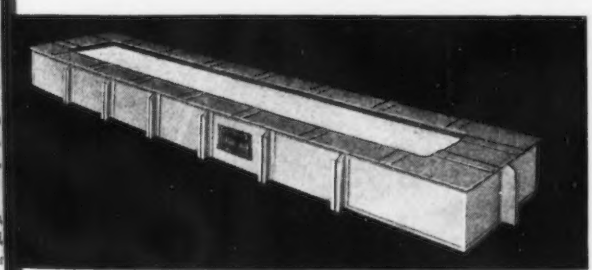
HARDENING, QUENCHING AND DRAWING UNIT

A representative Sunbeam Stewart automatically controlled continuous conveyor type hardening, quenching and drawing installation. Has automatic temperature control, wide operating range, variable production capacity and automatic handling through all operations.



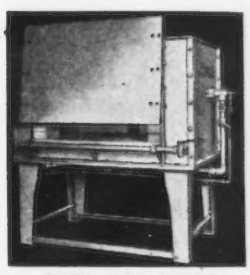
HEAVY PORTABLE OVEN FURNACE

Rugged, heavy-duty casing, lining and insulation, combined with the carefully engineered combustion, atmosphere and temperature control make Sunbeam Stewart Heavy Portable Oven Furnaces outstanding in production and uniform results. Available in under-fired semi-muffle, or over-fired construction.



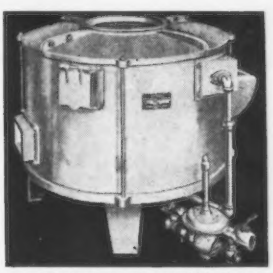
GALVANIZING FURNACE

Typical of the many installations Sunbeam Stewart has engineered for galvanizing wire, sheet, hollow-ware, tanks, pipe fittings, plumbing fixtures, etc. Features of these settings are the long pot life, low dross loss, and high production made possible by the Sunbeam Stewart principle of "high-firing" with baffle protection for pot.



OPEN SLOT FORGE

Designed for drop hammer work or similar operations requiring a continuous feed of heated work. Also especially suitable for end heats. Design of heat shield and air blast provides maximum of comfort for operator.



ROUND POT FURNACES

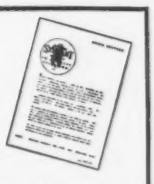
Such processes as lead, cyanide, and salt bath hardening, oil or salt tempering are carried out in thousands of these versatile units. Easy temperature control, uniformity of temperature, and long pot life are features of this unit.

ROTARY HEARTH FORGE

Circular tunnel-type rotary hearth is sand-sealed and friction driven at three points. Engineered to meet large heavy-duty production requirements, this installation guarantees the thorough even heat good forging and piercing practice requires.

FREE

"Guide to Furnace Selection"



Has the answer to the type of gas or oil-fired furnace best suited for your requirements. Write Sunbeam Stewart Dept. 110 for this handy furnace guide today.

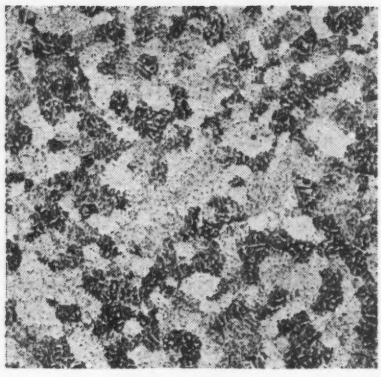
SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION

(Formerly CHICAGO FLEXIBLE SHAFT CO.)

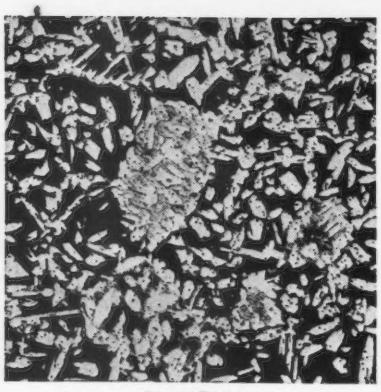
Main Office: 4433 Odgen Ave., Chicago 23 — *New York Office:* 11 W. 22nd St., New York 18 — *Detroit Office:* 308 Boulevard Bldg., Detroit

Canadian Factory: 321 Weston Rd., S., Toronto 9

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problems with you.



Centrifugal Cast



Static Cast

LESS THAN ½ of 1% WASTAGE in 2 Years!

Less than ½ of 1% wastage of rough castings! That's the record that Roto-Met's centrifugal castings have compiled in the last two years. Think what that can mean to you in reduced scrap and machining costs.

What's more, you get longer tool life because the centrifugal method isolates dross in the casting bore. And centrifugal castings are 18% stronger* than static, yet cost no more. Note the dense, fine grain structure in the 25-dia. photo-micrograph at left. There are no shrink or dirt spots anywhere within the uniform structure. The next time you need brass, bronze or aluminum castings, get in touch with our Service Engineer. Roto-Met Centrifugal Casting Corp., 4300 West Monarch Place, Milwaukee 8, Wisconsin.

*Nickel alloy. All non-ferrous alloys, 6% to 18% strength increase.

ROTO-MET CENTRIFUGAL CASTING CORPORATION

10,000 TRADE NAMES

Al-Ox: Aluminum-oxide belt, sheet and general-purpose abrasives. Clover Mfg. Co., Norwalk, Conn.

Alox: Rust preventative and lubricant. Alox Corp., 3943 Buffalo Ave., Niagara Falls, N. Y.

Aloxite: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Aloxite Brand: Abrasives and coated abrasives. Carborundum Co., Niagara Falls, N. Y.

Alpax: Aluminum alloy with Cu-Mg-Ti, for light-alloy parts. Alais, Forges et Camargue, Paris, France.

Alpax: Corrosion-resistant aluminum alloy with 10-13 Si, 0.2 max. Ti for water pumps, engine parts, valve bodies. Birmingham Aluminum Casting Co., Birmingham, England.

Alpax: See Silumin.

Alpax: 12 Si-Fe alloy for light corrosion resisting castings. Lightalloys Ltd., London, England.

Alpha: Copper alloy with Pb, Fe and Zn for condenser tubes and pipes. Chase Brass & Copper Co., Inc., Waterbury, Conn.

Alpha: Sn alloy for babbitts, bearings. National Bearing Metals Corp., 5002 Manchester Ave., St. Louis.

Alpha Crusher: Tin-base babbitt metal for bearings. National Bearing Div., American Brake Shoe Co., 5002 Manchester Ave., St. Louis.

Alpha Gamma: Corrosion resistant aluminum alloy with 10-13 Si and Mg, for light-alloy castings. Birmingham Aluminum Casting Co., Birmingham, England.

Alpine: Blowers, etc., Dayton Electric Mfg. Co., 513 S. Green St., Chicago.

Alpine: White enamel coatings for metal. Tropical Paint & Oil Co., 1210-52 W. 70th St., Cleveland.

Alplate: Corrosion resistant Al coated steel wire for screens, electrical resistance heating elements. Reynolds Metal Co., Louisville.

Alpro: Abrasion, wear and shock-resistant copper alloys with 10 Al for gears, cams, valves and ball bearings. Alloys & Products, Inc., Oak Point Ave. & Barry St., New York.

Alpro: Series of nonferrous alloys containing Mn, Cu, Al, Ni, Si, Mg; for alloying, deoxidizing, hardening, and also in marine air service. Alloys & Products, Inc., Oak Point Ave. & Barry St., New York.

Alray: Nickel-chrome resistance wire. Alloy Metal Wire Co. Inc., Prospect Park, Pa.

Alrok: Aluminum and its alloys in cast or wrought form, provided with an integral corrosion-resistant coating. Aluminum Co. of America, Oliver Bldg., Pittsburgh.

Alsex: Aluminum alloy with Si-Mg, for light-alloy parts, forgings. Allgemeine Elektrizitats Gesellschaft, Berlin, Germany.

Alsifer: See Vancoram.

Alsifer: Al-Si-Fe alloy used principally as steel deoxidizer and for grain size contr Vanadium Corp. of America, 420 Lexington Ave., New York 17.

Alsiloy: Corrosion-resistant aluminum allo with Si-Cu-Fe, for light-alloy castin Doehler Die Casting Co., Toledo.

Alsimac: Pressed and extruded steatic el trical insulation, fire and acid-proof, no absorbent. American Lava Corp., Kru Bldg., Chattanooga, Tenn.

Alsimag 222: Machinable, ceramic mater with low dielectric loss at high frequen for temperatures up to 2500°F; available rounds, disks, plates and special shap American Lava Corp., Kruesi Bldg., Chat nooga, Tenn.

Altercut: High-speed chucking reamers h ing alternate right and left-hand spiral c ting edges. Whitman & Barnes, Detroit

Alternarc: Welding and cutting devices. El tric Arc, Inc., 152-162 Jelliff Ave., Newa N. J.

Alternex: Arcwelding electrode for steel; c responds to AWS E-6013. Metal & Ther Corp., 120 Broadway, New York 5.

Altior: White antifriction metal for bearin T. M. Birkett & Sons, Ltd., Hanley, gland.

Alto: High-speed tapping machines. A Mfg. Co., Wolfram & Paulina Sts., Chica

Alual: Aluminum wire and strip. Ameri Steel Co., Park Bldg., Pittsburgh.

Aludur: High corrosion resistant alumin alloy with Mg, Si, and Fe for overh transmission lines. Guilini Werke A. Rohrschach. Switzerland.

Alufont: Corrosion resisting aluminum a with 2 Cu, 12 Zn, 1.4 Fe, low Mg-Si; large castings in general applicati Aluminum Industrie A.G. Neuhau Switzerland.

Aluma: Firebrick. Seaboard Refractories Perth Amboy, N. J.

Aluma: 1.5 Mn aluminum alloy for gen application. Aluminum Belge S. A., L Belgium.

Alumag: Two types of aluminum alloy 4-10 Mg, for light alloy parts. Stedes minoirs et Trefileries du Havre, P France.

Alumalun: Al, Si alloy plus abrasive gr for floor plates, stair treads and car st American Abrasive Metals Co., Sayr Coit Sts., Irvington 11, N. J.

Aluman: Aluminum alloy with 1.5 Mn low Si-Fe-Cu; for marine construction chemical apparatus. Aluminum Indu A. G., Neuhausen, Switzerland; Lavara Leghe Leggere, Milano, Italy.

Alumasod: 76-23 brass with 1 Cd used a solder. Lloyd S. Johnson Co., 224 Indiana Ave., Chicago.

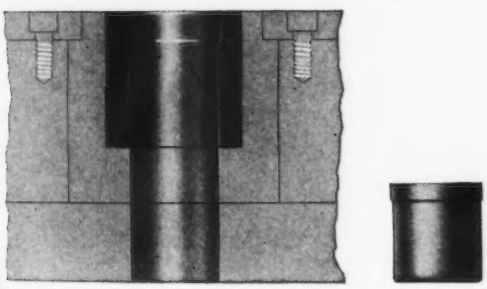
Alumaweld: Aluminum solder and flux. L S. Johnson Co., 2245 S. Indiana Ave., cago.

Alumaweld: Alloy of tin-zinc-lead wi chemical catalyst; for soldering all m especially Al and white metals. Al weld Co. of America, 2241 S. Indiana Chicago.

Alumaweld Special: Solder for Al and

PRODUCTION UPPED FROM 60,000 PIECES TO 700,000

changing to CARBOLOY* Sheet Metal Dies!



Pieces were drawn from steel .030" thick, using Carboloy Cemented Carbide deep-drawing dies. Although part design and tolerances were critical, a continuous high production average was obtained through use of die ring inserts.

IN DRAWING REFRIGERATOR MUFFLER SHELLS FROM .030" STEEL, production was increased over 11 times with the relatively simple change to Carboloy Cemented Carbide Sheet Metal Dies. And these results are typical of the tremendous production improvements which follow the change to Carboloy Cemented Carbide Dies in *all* Cupping, Blanking, and Drawing operations.

Users regularly report closer tolerances on drawn parts—fewer "rejects"—lower cost per piece—virtually mirror-smooth surface finish (often markedly reducing buffing time)—and big increases in output-per-press.

Put these improvements into *your* operations! Change to Carboloy Cemented Carbide Dies. (Booklet D-120 gives you an idea of the results you'll get. Send for it today—free.)

Carboloy Company, Inc., 11153 E. 8 Mile St., Detroit 32, Mich. Offices in Chicago, Cleveland, Detroit, Houston, Los Angeles, Milwaukee, Newark, Philadelphia, Pittsburgh, Thomaston, Connecticut.

* CARBOLOY (TRADEMARK) CEMENTED CARBIDE

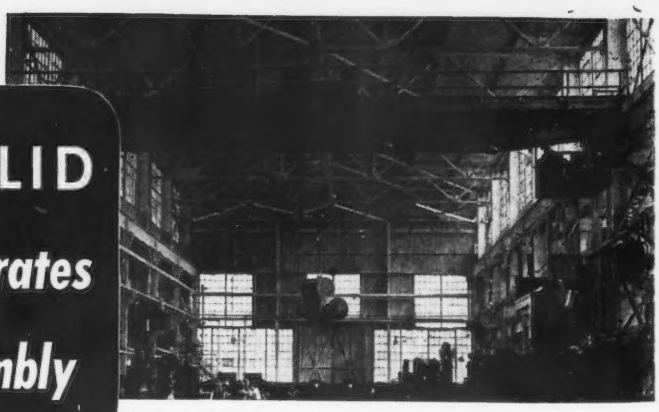
ET METAL DRAWING AND BLANKING DIES

INCREASE OUTPUT

EXTEND DIE LIFE

HOLD CLOSE TOLERANCES

REDUCE "REJECTS"



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THE HUGHES-KEENAN COMPANY
571 NEWMAN STREET . . . . MANSFIELD, OHIO

Roustabout Cranes
By Hughes-Keenan
Load-Handling Specialists Since 1904

alloys. Lloyd S. Johnson Co., 2241 S. Indiana Ave., Chicago.

Alumbrite: Aluminum paint. Thompson & Co., 1085 Vincent St., Oakmont, Pa.

Alumbro: Zinc-bearing copper alloy for condenser tubing to resist sea water corrosion. Muntz's Metal Co., Birmingham, England.

Alumel: Nickel alloy with Si, Al, Fe and Mn for electrical-resistance and heat-resisting parts. Hoskins Mfg. Co., Lawton & Kinnison Aves., Detroit 8.

Alumend: Si-free rod for aluminum welding. Arcos Corp., 1515 Locust St., Philadelphia.

Alumetal: Special aluminum solder. Braun-Steeple Co., Ltd., 370 Brannan St., San Francisco.

Alumex: High-alumina brick. Mexico Refractories Co., Mexico, Mo.

Alumiflux: See Allen.

Alumikote: Aluminum paint. Vita-Var Corp., 48 Albert Ave., Newark, N. J.

Alumilite: Protective and decorative coating for aluminum. Aluminum Co. of America, Gulf Bldg., Pittsburgh.

Alumina: Grinding Wheels. Bridgeport Safety Emery Wheel Co. Inc., 1295 W. Broad St., Bridgeport, Conn.

Aluminall: Aluminum paint. Kepec Chemical Corp., 4th & Cherry, Milwaukee.

Aluminark: Aluminum welding electrode. Westinghouse Electric Corp., East Pittsburgh.

Aluminax: Aluminous-oxide brick. Seaboard Refractories Co., Perth Amboy, N. J.

Aluminite: Paste (non-ferric) abrasive. E. Reed Burns Mfg. Corp., 37 Withers St., Brooklyn.

Aluminized: Aluminum-coated steel sheets and coils with high heat reflectivity, excellent resistance to corrosion and to destructive heat scaling up to 1600°F. American Rolling Mill Co., 303 Armco Av., Middletown, Ohio.

Alum-In-Oil: Aluminum paint. Thompson & Co., 1085 Vincent St., Oakmont, Pa.

Aluminold: Grinding wheels. General Grinding Wheel Corp., 3138 East Thompson St., Philadelphia.

Aluminox: Grinding wheels and artificial abrasive produced from bauxite. American Emery Wheel Works, Richmond Square, Providence.

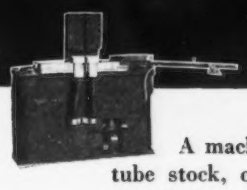
Aluminox: Rods for acetylene welding. Central Steel & Wire Co., 4531-4561 S. Western Blvd., Chicago.

Aluminum: Babbitt metal. National Bearing Metals Corp., 5000 Manchester Ave., St. Louis.

Aluminum Brass: 76 Cu, 22 Zn, 2 Al, with high resistance to corrosion; for condenser tubes. Wolverine Tube Div., 1467 Central Ave., Detroit 9.

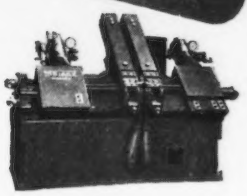
Aluminum Fix: Aluminum solder and filler. Aluminum Fix Co., 1862 E. 123rd St., Cleveland.

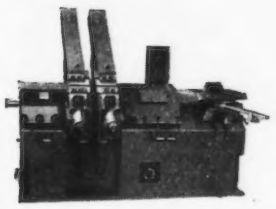
Sciaky Announces a Complete Line of *Advanced** Flash Welding Equipment

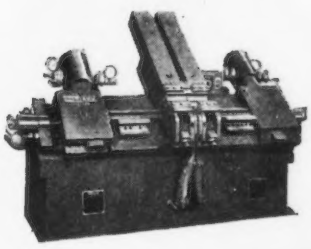


A machine for most every flash welding job—mitred sash, bar and tube stock, castings, etc.—is included in this series of *modern* welders. Revolutionary features in design and construction put these machines years ahead—in weld quality, flexibility and long life. Capacities range from .90 sq. in. cross sectional area on small hand-operated machines up to 5 sq. in. on large, completely automatic power-operated welders.

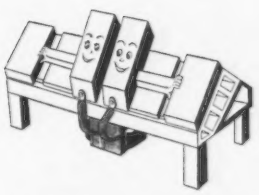
***and here's what we mean by Advanced**



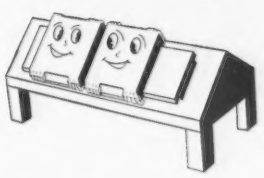




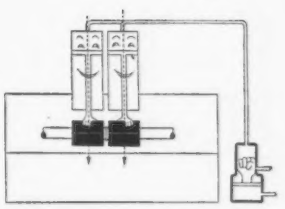
FRAMES are constructed as a sturdy, self-contained beam. Conductors from transformer to dies are placed *outside* the frame—eliminating need for weakening cutout and protecting transformer from flash sparks.



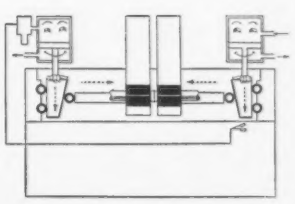
PLATENS move on a wide, rigid, T-shaped bed. Stresses are distributed over both upper and lower large, flat bearing surfaces. Accurate guiding is assured by narrow key. Tapered gibs maintain proper clearance.



CLAMPS are actuated by a booster-supplied high pressure hydraulic system. This allows cylinders of small diameter to be used which can apply force *directly in line* with clamps.



FLASHING and UPSETTING is controlled by air cylinders driving wedge-shaped cams between rollers. On power-operated welders, both platens move to allow independent control of flashing and upsetting. Heavy duty machines are equipped with two transformers—one connected to upper dies and the other to lower dies. Thus, perfect distribution of heat is assured on work such as large tubes.



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Aluminweld: Arc-welding electrode to weld aluminum. Lincoln Electric Co., 12818 Coit Rd., Cleveland 1.

Alumiprep: For treatment of aluminum alloys prior to painting or welding, for better paint adhesion and better welding. Neilson Chemical Co., 6564 Benson St., Detroit 7.

Alumish: Mold blacking for aluminum foundries. James Durrans & Sons, Ltd., Penistone, nr Sheffield, England.

Alumite: Aluminum paint. Roscoe Laboratories, 369 Hudson St., Brooklyn.

Alumon: Process for electroplating upon aluminum. Enthone, Inc., 442 Elm St., New Haven, Conn.

Alumox: Chemical treatment for aluminum alloys to impart corrosion protection and to prepare surface for organic finishing. Solution dip at 210°F for 20 min. Enthone Co., 442 Elm St., New Haven, Conn.

Alundum: Abrasive cloth. Armour Sand Paper Wks., Div. of Armour & Co., 1353 W. 31st St., Chicago.

Alundum: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Alundum: Various types of aluminum-oxide abrasives. Norton Co., Worcester, Mass.

Alundum Scythe: Abrasive stones. Behr-Manning Corp., Troy, N. Y.

Alunyte: Magnesium-bearing aluminum alloy for dairy equipment. Pittsburgh Brass Mfg. Co., 3155 Penn Ave., Pittsburgh.

Alusite: High-aluminum refractory brick. Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh.

Alva: Spring steel. Crucible Steel Co. of America, Chrysler Bldg., New York.

Alzak: Aluminum reflectors. Aluminum Co. of America, Oliver Bldg., Pittsburgh.

Amaloy: 2.5-10 tin-lead alloys for protective coating against corrosion. American Machine & Foundry Co., 59 W. 42nd St., New York.

Amarine: Rubber insulated wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Amazon: Blower & pumps. Pine-Ihrig Co., Amazon St., Oshkosh, Wis.

Amberlac: Synthetic resins and resin adhesives. Resinous Products & Chemical Co., 226 W. Washington St., Philadelphia.

Amberlite: Synthetic iron exchange resins & resin adhesives. Resinous Products & Chemical Co., 226 W. Washington Sq., Philadelphia.

Amberoid: Nickel silver for deep stamping in electroplate trade. Barker & Allen Ltd., Birmingham, England.

Ambest: Metallic packing. Eureka Packing Co., 250 48th St., Brooklyn.

Amboy: Foundry moulding sand. Marcus S. Wright, Inc., South River, N. J.

Amboy: Ground fire clay. United Clay Mines Corp., 109 Oakland St., Trenton, N. J.

Ambrac: Corrosion-resistant 30 Ni, Cu-Zn alloy for laundry and paper machinery. American Brass Co., Waterbury, Conn.

Ambrac A: 20 Ni, 5 Zn and 75 Cu alloy for laundry and paper machinery. American Brass Co., Waterbury, Conn.

Ambraloy: Copper with 8 Al for corrosion-resistant screw-machine parts, wire, rod. American Brass Co., Waterbury, Conn.

AMC Treatment R: Anodic oxidation treatment with chromate sealing for protecting magnesium alloys and acting as paint base. American Magnesium Corp., 2224 Harvard Ave., Cleveland.

Amco: Pulverized coal systems. Amsler-Morton Co., Fulton Bldg., Pittsburgh.

Amco: Soldering flux and metal coating and powder for repairing galvanized coatings. American Solder & Flux Co., 2151 E. Norris St., Philadelphia.

Amco Galvanizing Powder: Preparation for repair of all damaged galvanized surfaces. American Solder & Flux Co., Trenton Ave. & Norris St., Philadelphia 25.

Amcohood: Welders helmets and handshields. Eastern Equipment Co. Inc., Willow Grove, Pa.

Amcorod: High-test and low-carbon steel oxyacetylene welding rods; also low-fuming bronze rods. Eastern Equipment Co., Inc., Willow Grove, Pa.

Amcoweld: Complete line of welding accessories, both arc and oxyacetylene, including leather clothing. Eastern Equipment Co., Inc., Willow Grove, Pa.

Amerbestos: Flamepreof felted asbestos insulated wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Amerclad: All-rubber electrical wires and cables. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amercoat: Alkali and acid resistant plastic coatings for interior and exterior of tanks and structural steel exposed to corrosive chemicals or food products. American Pipe & Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54.

Amercoat: Odorless, tasteless, and chemically inert liquid plastic; resists abrasion, stable in contact with salt water, mineral acids, alkalies, oils, fats, gasoline, mineral salts and alcohol. American Oil & Paint Co., 9900 Harvard Ave., Cleveland.

Amercord: Electric appliance cord spring. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amercote: Tacks. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amercut: Free-machining steels for automatic screw-machine operations. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

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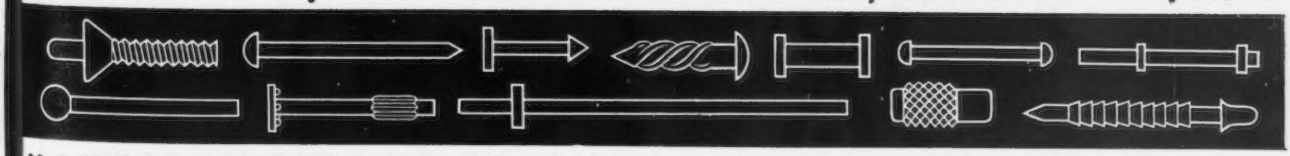

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10,000 TRADE NAMES

Amerfelt: Weatherproof wire. American Steel & Wire Co., Cleveland 13.

Amerglass: Glass insulated wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amergraph: Electrical cables. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amergrip: Box band seals. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amerground: Steel wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Amerhead: Series of case-hardening steels for bolts, shafts, screws. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

American: Aerial tramways. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

American: Bale ties; hexagon poultry netting; tacks and lawn fence; wire hoops; woven wire fence. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

American: Blast furnace valves and equipment. Wm. H. Bailey Co., Magee Bldg., Pittsburgh.

American: Broaching machines and tools. American Broach & Machine Co., Ann Arbor, Mich.

American: Electric furnaces. American Electric Furnace Co., Von Hiller & Juthe Sts., Boston.

American: Emery, Keystone Emery Mills, 1659 Church St., Frankford, Philadelphia.

American: Furnaces. American Furnace & Foundry Co., Milan, Mich.

American: Grinding wheels. American Emery Wheel Works, 1 Richmond Sq., Providence.

American: Pipe, tubing and bar benders. American Pipe Bending Machine Co. Inc., 33 Pearl St., Boston.

American: Roller bearings. American Roller Bearing Co., 400 Melwood Ave., Pittsburgh.

American: Screen cloth made from bronze, copper, stainless steel, monel, steel and aluminum. Wickwire Spencer Steel Div., 500 Fifth Ave., New York 18.

American: Series of highly alloyed steels for high pressure, and valve castings, oil refinery valves and fittings, structural and aircraft castings. American Steel Castings Co., Avenue "L" and Herbert Ave., Newark, N. J.

American: Ventilating fans, pressure blowers and other air-handling systems. American Blower Corp., Detroit 32.

American Brand: Magnet wire. Electric Auto-Lite Co., Wire Div., Port Huron, Mich.

American Eversharp: Steel grit. American Steel Abrasive Co., 1933 Sherman St., Galion, Ohio.

American Glidden: Barbed wire. American Steel & Wire Co., Cleveland 13.

American Hexagon: Wire netting. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

American Hex-Cel: Wire netting. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

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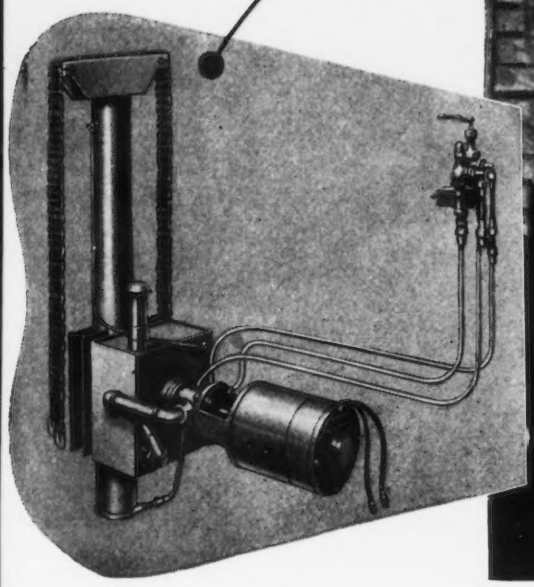
only the MERCURY Hydraulic Lift offers BALANCED SUSPENSION



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2. **Simple Design:** Requires less than 50% of the usual number of moving parts.
3. **Economy:** No power required to lower load—no power wasted in lifting.
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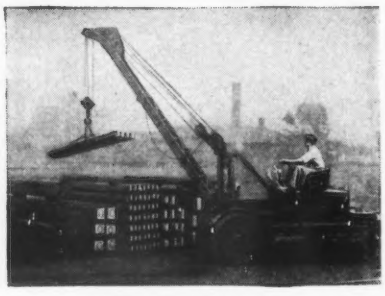

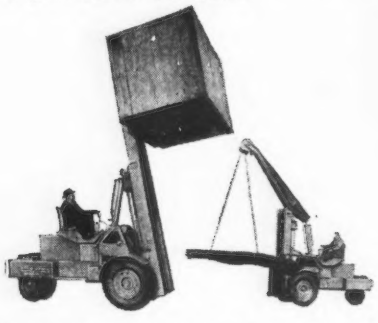

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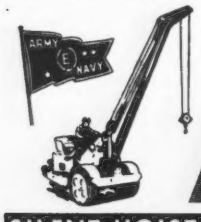
The Combination Mobile Boom Crane and Fork Lift Truck

You have at your disposal a machine that is a MOBILE BOOM CRANE when you have crane work —a FORK LIFT TRUCK when you have pallet loads. For crane work, just fold back the forks. For fork jobs, quickly and easily remove the boom. Also obtainable as a FORK TRUCK exclusively — without boom; or as a BOOM CRANE only—without forks.

Power equipment speeds handling of heavy machinery, raw materials, crates, pallet loads, steel, metal scrap (magnet and clamshell bucket available) . . . storing, stacking, tiering inside the plant or in the yard . . . loading and unloading of freight cars, trucks, trailers . . . plant alterations and repairs. Write for Catalog No. 58 on ***KRANE KAR*** and Bulletin No. 65 on ***LIFT-O-KRANE.***



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American Marsh: Air compressors, centrifugal pumps and steam pumps. American-Marsh Pumps, Inc., 205 Capital Ave., Battle Creek, Mich.

American Miller: Milling machine. J. L. Lucas & Son, Inc., Bridgeport, Conn.

American Straightline: Wire netting. American Steel & Wire Co., Cleveland 13.

American Swiss: Files, plumb bobs, punches, chisels, knurls, machinists' tools, etc. American Swiss File & Tool Co., 400 Trumbull, Elizabeth, N. J.

American T: Steel posts. American Steel & Wire Co., Cleveland 13.

American Tiger Brand: Wire rope. American Steel & Wire Co., Cleveland 13.

Americane: Rubber covered wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Americore: Silk and cotton lamp cords. American Steel & Wire Co., Cleveland 13.

Amerigear: Flexible couplings. American Flexible Coupling Co., Erie, Pa.

Amerite: Rubber covered and signal wires. American Steel & Wire Co., Cleveland 13.

Amerox: Welding and cutting apparatus. American Oxygen Service Corp., 609 Essex St., Harrison, N. J.

Amerstrand: Steel strand. American Steel & Wire Co., Cleveland 13.

Amerstrip: Cold-rolled strip steel. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Amertel: Telephone and telegraph wire. American Steel & Wire Co., Cleveland 13.

Amer-Tran: Industrial transformers. American Transformer Co., 172 Emmett St., Newark, N. J.

Amerzone: Rubber insulated wire. American Steel & Wire Co., Cleveland 13.

A. M. F. Alloy: Nickel-iron alloy with 0.3 C and 0.3 Mn for valves of expansion, refrigeration machines. R. Y. Ferner Co., 131 State St., Boston.

Am Forge: Upset and drop forgings. American Forge Div., American Brake Shoe Co., 2637 S. Hoyne Ave., Chicago.

Amgal: Galvanized wire rope. American Steel & Wire Co., Rockefeller Bldg., Cleveland.

Ammco High Speed: Honing and lapping machine. Automotive Maintenance Machinery Co., 2128 Commonwealth Ave., North Chicago, Ill.

Ammo: Washing powder & detergents. Enoch Morgan's Sons Co., 439 West St., New York.

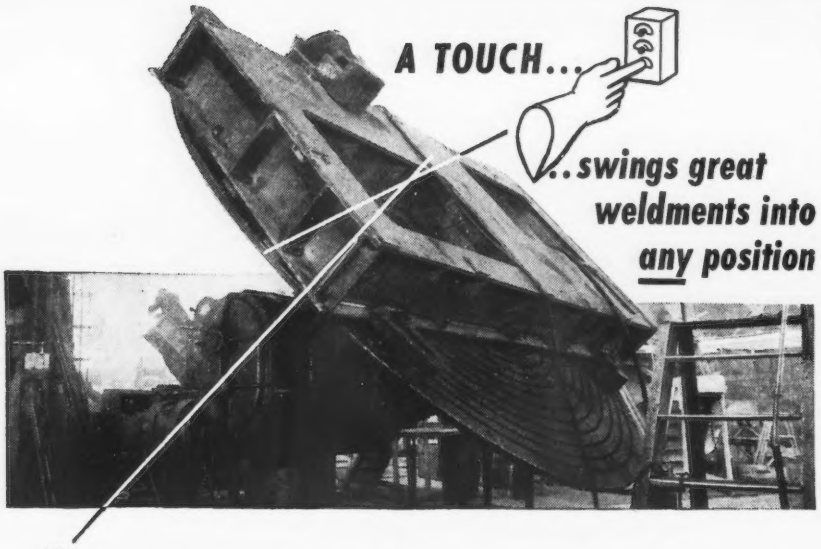
Ammogas: Electric heat treating furnaces. Westinghouse Electric Corp., East Pittsburgh, Pa.

Ammonoduct: Pipe of low-carbon openhearth steel, extremely soft and ductile; for refrigeration equipment, radiant heating installations, railway service and applications involving severe coiling and bending. Bethlehem Steel Co., Bethlehem.

A-Mol: Molybdenum hacksaw blades. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis 9.

Amola: C-Mn-Mo steel for gears, axles, shafts. Chrysler Corp., Detroit.

Visual proof of the value of interrupted quenching! The top two knife blades, quenched the old way, show cracks and warpage. The lower knife blade shows that Mar-Temp Salt at 400° F. holds them straight, with no loss in RC hardness. For details, write E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.



WHEN weldors can swing tons of weldment into any position for the next downhand pass quickly and safely, with a touch on the push button control, they are able to work better, faster and more economically, no matter what the job. Interruptions in any welding operation are costly—when welders or their helpers must prop up, flop, turn over, crawl under, over and around a weldment, they are adding costs to the job. Because more and more welding is being done in today's production, it is important that your welding costs and quality be examined in the light of economies and improvements made possible by C-F Positioners.

Not only do C-F Positioners give weldors more time for welding by permitting them to swing weldments into the correct position for a downhand pass, they make all welding better and more economical by making possible the use of heavier electrodes, eliminate "over-welding" and waste of power and materials. Write for Bulletin WP 22. CULLEN-FRIESTEDT CO., 1303 S. Kilbourn Ave., Chicago 23, Ill.

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C-F positioned welds mean better, more economical welds

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

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For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

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100 20th Street Moline, Illinois

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Amni Alloy: Pure nickel anodes, ingot and shot nickel, nickel-chrome-iron, nickel-copper alloy, cupro nickel, and nickel iron. American Nickel Alloy Mfg. Corp., 30 Vesey St., New York.

Ampac: Alternating-current welders. Allis-Chalmers Mfg. Co., Milwaukee 1.

Amparak: Rubber covered wire. American Steel & Wire Co., Cleveland 13.

Ampco: Drills, reamers, end mills, etc. Ampco Twist Drill Co., Belen & Jacobs Sts., Jackson, Mich.

Ampco: Series of copper alloys with Al-Fe and special agents for corrosion resistant bushings, machine parts, gears, cams, tools. Ampco Metal Inc., 1745 S. 38th St., Milwaukee.

Ampco Blades: Centerless-grinder blades made of a hard Ampco aluminum bronze. For grinding stainless steel and materials which tend to "pick up" and scratch. Foulk Mfg. Co., 4208 Airport Rd., Cincinnati 26.

Ampco-Clad: Rolled sheet bonded or clad with Ampco Metal for tanks, vessels, water softeners, etc., where strength and superior corrosion resistance are necessary. Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4.

Ampcoloy: Aluminum bronze, nickel bronze, manganese bronze, tin and high-lead bronze, beryllium copper and copper alloys of high electrical conductivity. Ampco Metal Inc., 1745 S. 38th St., Milwaukee 4.

Ampco Metal: Aluminum-bronze alloy, having great strength, controlled hardness, wear resistance and noncorrosive properties; excellent bearing characteristics, nonmagnetic and nonsparking. Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4.

Ampco-Trode: Coated aluminum-bronze welding electrodes, suitable for welding dissimilar metals, brass, bronze, cast iron, steel, manganese bronze and nickel alloys. Ampco Metal, Inc., 1745 E. 38th St., Milwaukee 4.

Ampco-Trode 10: 89 Cu, 10 Al, 1 Fe welding rod having high strength and ductility; not hot short; metal or carbon arc or gas welding of brass and bronze, malleable iron, gray iron and steel. Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4.

Amperox: Rubber insulated wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Amplex Oils: Non-fluid oils. Cities Service Oil Cos., 70 Pine St., New York 5.

Ampyrol: Synthetic resin insulated wire. American Steel & Wire Co., Cleveland 13.

Amron: Corrosion-resistant paint. United States Stoneware Co., 174 Annadale Ave., Akron, Ohio.

Amsco: Manganese steel; also products such as welding rod, dippers, chain, wheels, dredge pumps. American Brake Shoe Co., 230 Park Ave., New York 17.

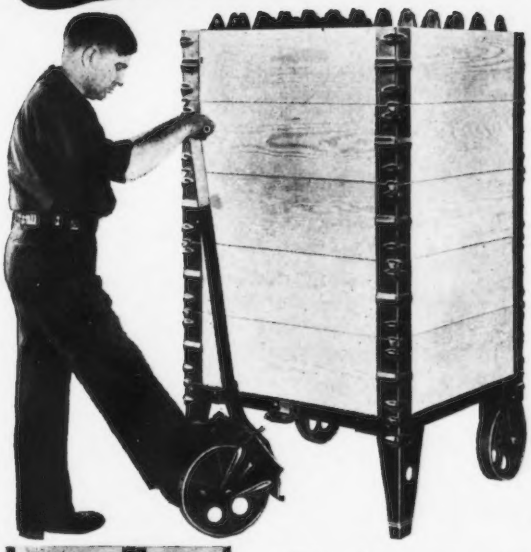
Amsco: Manganese steel castings, alloy steel castings, material handling pumps, dredging pumps, apron feeders, dredge buckets, power shovel dippers, and welding rods for hard-facing and reclamation. American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.

Amsco: Series of heat resisting chrome-nickel-iron alloys for furnace parts, valves, dampers, beams. American Manganese Steel Co., 389 E. 14th St., Chicago Heights, Ill.

Better than Building! Save Present Floor Space

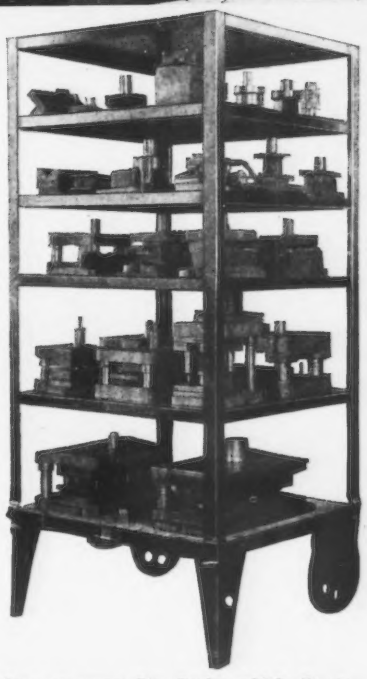
with

THE TURNER SYSTEM OF MATERIALS HANDLING

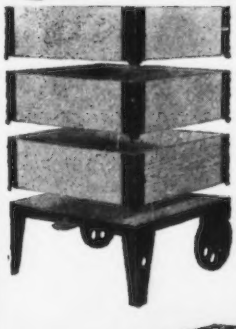


Enlarge Your Factory Without Enlarging Buildings!

If other firms have saved up to 50% of floor space with the TURNER SYSTEM, isn't it the sensible thing to get the *whole* story *before* you decide you *must* build? In these days when building costs are soaring you can save yourself some real "headaches" by letting the TURNER SYSTEM make the most of what you have. Then, when you *do* build, you have the benefit of *double* saving.



One of many Die Racks which fit on the Transport . . . protect and quickly transport large and small dies.



"Deliver the Bin and Save the Handling"

The Transport is half truck, half platform . . . it has the advantages of both, the disadvantages of neither. Fitted with Bin Sections (wooden-side or all-steel), Racks, Trays and Die Tables, it is moved by hand "Jimmy," power lift truck, crane or tractor. Bins are always the right size because Sections (left) are removed as load diminishes, added as load increases. Cuts labor costs in a big way.

Illustrated is Floor Plate Deck Transport. Other types have Wooden, Grid and Flat Steel decks.

The Turner System Provides Vertical and Horizontal Expansion to the Nth Degree of Efficiency

You Can Try It in Your Plant!

Write Today for:

1. 60 Day Free Trial Offer.
2. Descriptive Book on the Turner System.

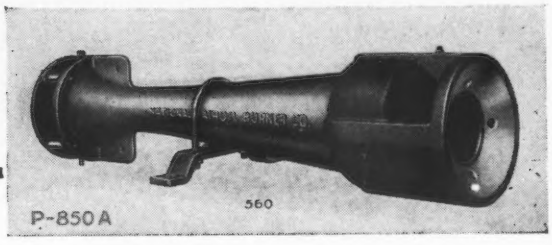
Shelf Racks on movable Transports. Each section may be moved as required.

FACTORY SERVICE COMPANY

4621 NORTH TWENTY-FIRST STREET — MILWAUKEE 9, WISCONSIN

NATIONAL AIROIL FUEL OIL · GAS BURNERS

"AIROCOOL" GAS BURNERS



produce a non-luminous flame with highest heat liberation

"Airocool" Gas Burners, of venturi type, assure: maximum percentage of primary air-inspirated; close adjustment of primary air-gas ratio; a non-luminous flame with highest heat liberation throughout its capacity range; and easy removal and replacement of gas orifice.

Its patented "Airocool" Nozzle directs the separate ignitor flames against the main volume of the mixture to insure stable ignition; prevents overheating and burning of the castings; and allows greater turndown without flame burnback.

For full information about "Airocool" Gas Burners and "Airocool" long life Nozzles, write for supplement #3 to bulletin 55.

NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: 1271 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.
Texas Office: 2nd National Bank Bldg., Houston

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

Do you use Perforated Metal?

If perforated metal is required for any of your products, let Hendrick quote on fabricating it to your specifications. An unsurpassed stock of tools and dies, and ample plant facilities, enable Hendrick to give unexcelled service in furnishing perforated metal with any shape or size of openings, from any commercially rolled metal, in any desired gauge. Write for full information.

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HENDRICK

Manufacturing Company

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

37 DUNDAFF STREET, CARBONDALE, PENNA.

Sales Offices In Principal Cities

10,000 TRADE NAMES

Amsco, Mo-Mang: Free-flowing, very tough, Mn-Mo steel work-hardening to 500 Brinell. For straight build-up welding of worn manganese steel, carbon steel or gray-iron parts, such as bucket lips, crushed jaws, etc. American Manganese Steel Div., American Brake Shoe & Foundry Co., 389 E. 14th St., Chicago Heights, Ill.

Amsco-Nagle: Full line of industrial pumps. American Brake Shoe Co., 230 Park Ave., New York 17.

Amunite: Silicon Carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Amvar: Electrical wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Anaconda Bronze: 90-10 Cu-Sn bronze for hardware, tubes, bearings, bushings. American Brass Co., Waterbury, Conn.

Anaconda No. 997: Low fuming Cu alloy welding rod. American Brass Co., Waterbury, Conn.

Anaconda No. 624: Brass with 1 Sn, 1 Pb, 0.1 Al, 0.15 Si for pressure diecastings. American Brass Co., Waterbury, Conn.

Anaconda Super Nickel: 70 Cu-30 Ni for severe service condenser tubes. American Brass Co., Waterbury, Conn.

Analy-Graph: Furnace atmosphere recorder. Brown Instrument Co., Div. of Minneapolis-Honeywell Regulator Co., 4494 Wayne Ave., Philadelphia.

Anchor: Hydraulic hose couplings and hose assemblies. Anchor Coupling Co. Inc., 342 N. Fourth St., Libertyville, Ill.

Anchor: Brass and bronze. Federated Metals Div., American Smelting & Refining Co., 120 Broadway, New York.

Anchor: High-alumina brick. Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh.

Anchor Brand: Non-acid soldering flux. Garden City Laboratory, Inc., 2746 W. 37th Pl., Chicago.

Anchorbrand: Rivets, wire nails and wire products. Townsend Co., New Brighton, Pa.

Anchor Flange: Safety shoes with steel box toes. International Shoe Co., 1509 Washington Ave., St. Louis 3.

An-Cor-Lox: Lock nuts. An-Cor-Lox Div., Laminated Shim Co. Inc., 66 Union St., Glenbrook, Conn.

Anderometer: Production electronic instrument for the testing of completed ball bearings. Physicists Research Co., 343 S. Main St., Ann Arbor, Mich.

Anderson: Welding stand. Faribault Machine Shop & Foundry, Faribault, Minn.

Andes: Disk grinder. John F. Horting, Lancaster Pa.

Andrew: Boring machines. M. L. Andrew Co., Colerain & Alabama Sts. Cincinnati.

Anfriloy: Cu, Sn, Zn, Pb alloy. C. E. Phillips & Co., 324 S. Jefferson St., Chicago.

Angle Computer: Precision tool for reducing costs in layout inspection, and machining of castings, tools, jigs, dies, fixtures, forgings, and patterns. Angle Computer Co., 1709 Standard Ave., Glendale 1, Calif.

Angle Set: Magnetic chucks. Diamond Tool Co., 41st St. at Ellis Ave., Chicago.

Angle Stem: Foundry chaplets. Combined

FOSDICK

RADIAL, SENSITIVE, UPRIGHT DRILLS AND JIG BORERS

Speed—plus Accuracy are more important today than ever before in all production programmes. But speed without accuracy is a waste of effort in the majority of industries.

Fosdick Radials, Jig Borers, Regular and Sensitive Upright Drills combine that all-important accuracy with speed. They helped factories produce the necessary products for war and final victory . . . are now helping with reconversion problems . . . and are ready to serve throughout 1947 in all parts of the world.

For specific data on Fosdick ultra-modern machine tools write or cable:

THE FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO, U. S. A.
Cable Address:
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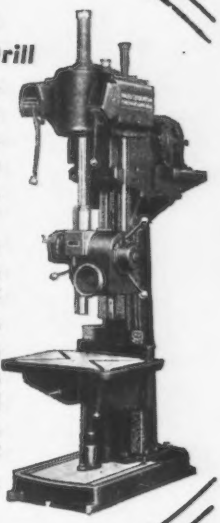
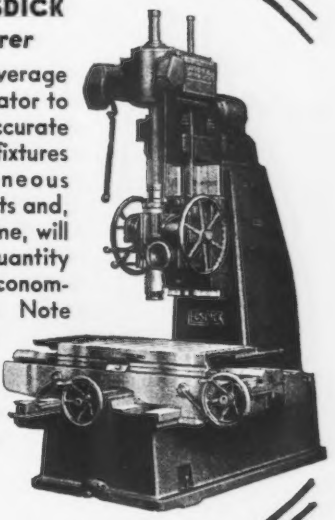
THE FOSDICK
Economax Upright Drill



meets the demand for a drill with a capacity between the sensitive and the heavy duty radial drill. These machines are built in 25" and 30" sizes, of both box and round column types. Any number of spindles from two to four can be placed on one pedestal. Fixtures may be moved along the table to avoid changing of tools in the spindle.

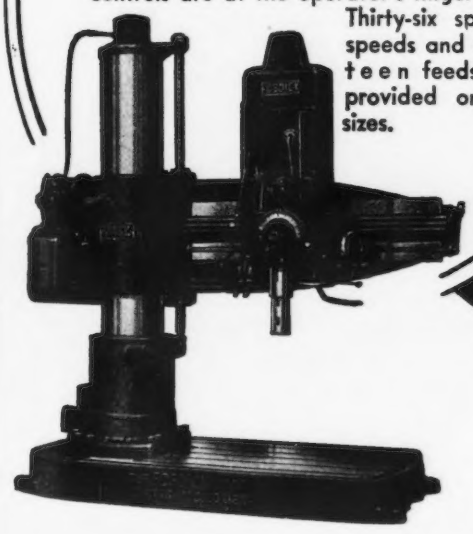
THE FOSDICK
Jig Borer



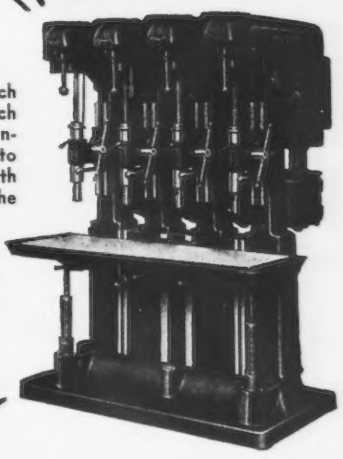
enables an average drill press operator to perform accurate work on jigs, fixtures and miscellaneous production parts and, at the same time, will make small quantity production economically possible. Note that all controls and operating handles are at the front of the machine.

THE FOSDICK
Radial Drills

are new in design and are completely hydraulically controlled. Variable rapid traverse to the head assists in locating the drill with the least amount of effort. The main drive motor driving the spindle also operates the hydraulic system. All controls are at the operator's finger-tips. Thirty-six spindle speeds and eighteen feeds are provided on all sizes.

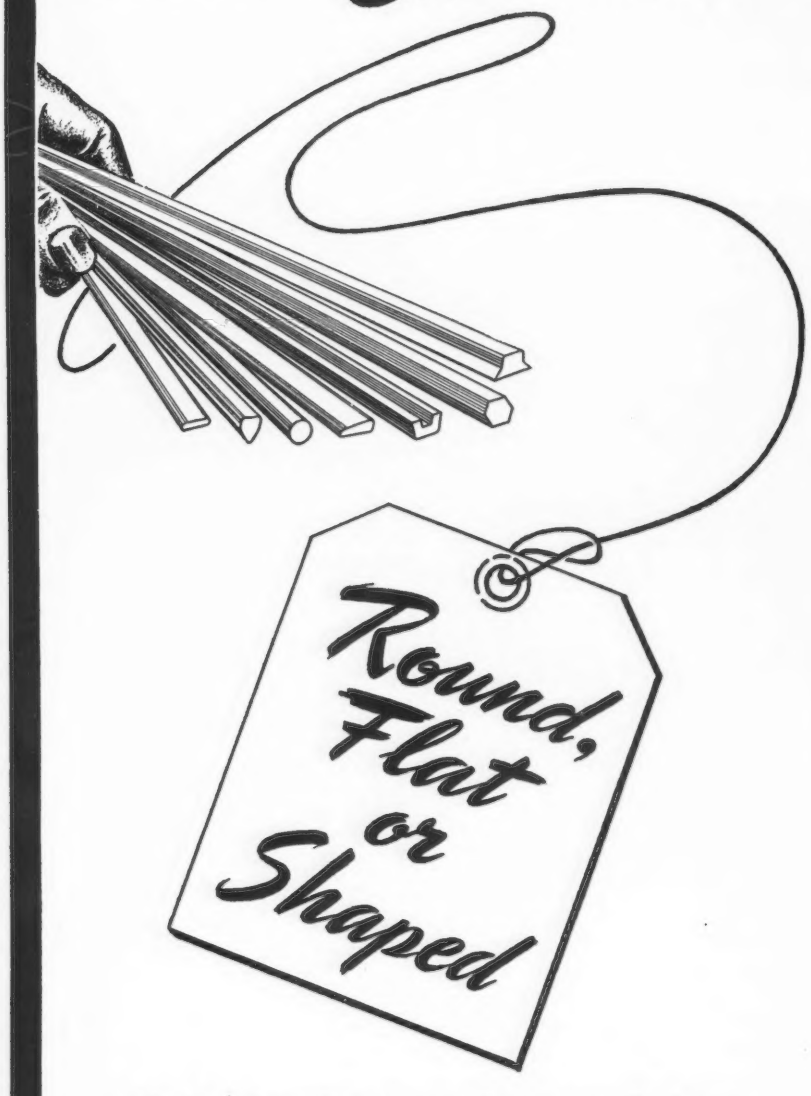


THE FOSDICK
High Speed
Sensitive Drills



are built in several types. In each type, one motor is used for each spindle. The capacity of these Sensitive Drills is from letter drills to 1½", and they are provided with such features as—Power Feed to the Spindle; Reversing Motor Tapping; Cutting Compound for the Spindles, etc. This range of Sensitive Drills provides spindle speeds from zero to 3,600. Any combination of drills can be purchased to suit a particular job.

PAGE *Stainless Steel* WIRE



● It isn't boasting to say that we really know something about stainless steel wire. Wire has always been the business of PAGE. And stainless steel wire has been a PAGE specialty almost since the introduction of stainless.

PAGE offers you a responsible source for wire and information about its use in production. High and low carbon steel, Armco iron as well as various analyses of stainless. Get in touch with PAGE.

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PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

10,000 TRADE NAMES

Supply & Equipment Co. Chandler & Le Vinness, Buffalo.

Angular: Steel grit. Pittsburgh Crushed Steel Co., 49th & Harrison Sts., Pittsburgh.

Anibal: Corrosion-resistant alloy with 42 Ni, 2 Cr, balance Fe, for clocks and balance wheels. Soc. Anon. de Commentry Fourchambault et Decazeville, Paris, France; R. Y. Ferner Co., Investment Bldg., Washington.

Anka: 20-10 Cr-Ni stainless steel for heat and corrosion-resistant parts. Brown, Bayley's Ltd., Sheffield, England.

Anni: Nickel. American Nickel Alloy Mfg. Corp., 50 Church St., New York.

Annis: Split core current transformer. R. B. Annis Co., 1100 N. Delaware St., Indianapolis.

Annite: Industrial cleaning materials. Quigley Co. Inc., 58 W. 45th St., New York.

Anode: Nonferrous alloy for general purpose welding. Lincoln Electric Co., 12818 Coit Rd., Cleveland.

Anodex: Compounds for cleaning ferrous and copper buffed metal with reverse current. MacDermid, Inc., Waterbury 88, Conn.

Anozinc: Compounds used in anodizing zinc plate and zinc diecastings which form black, yellow, or clear conversion coatings giving greatly increased corrosion resistance. United Chromium, Inc., 51 E. 42nd St., New York 17.

Anozinc: Yellow or black coating for zinc-base diecastings and electroplated zinc; applied electrolytically. United Chromium, Inc., 51 E. 42nd St., New York 17.

Ansandum: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Ansco: X-ray films and chemicals. Ansco, Binghamton, N. Y.

Ansilicon: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Ansolox: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Anthony: Wire fence. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Antacid: Acid proof enamel. Upco Co., 4800 Lexington Ave., Cleveland.

Antaciron: Acid-resisting iron. Worthington Pump & Machinery Corp., Harrison, N. J.

Anti-Acid Metal: Acid-resistant bronze (10 Sn-15 Pb) for chemical apparatus. H. Kramer & Co., 1343 W. 21 st., Chicago.

Anti Borax: Brazing and welding fluxes. Anti-Borax Compound Co., Wall St. at Miller, Fort Wayne, Ind.

Anticorodal: Aluminum alloys with Si-Mn-Mg for architectural applications, furniture, ship building and chemical industry. Aluminum Industrie A. G., Neuhausen, Switzerland; Lavorazione Leghe Leggere, Milano, Italy.

Anti-Corrode: Useful in spraying, brushing, or dipping for preventing rust and corrosion forming on metal surfaces. Cities Service Oil Co., Bartlesville, Okla.

Anti-corrodes: Rust preventives. Cities Service Oil Co., 70 Pine St., New York 5.

Anti Flux: Fireclay products. Chicago Retort & Fire Brick Co., 210 S. La Salle St., Chicago.

Anti-Fog: Compound for use on lenses and plates to help prevent fogging, steaming and frosting of glass surface. Removes

what's your need in SIZE?

Globe seamless steel tubing is made hot finished and cold drawn in alloy and carbon steels in sizes from ½ inch to 6⅝ inches outside diameter.

Globe seamless stainless steel tubing is available in tube sizes from ½ inch to 6⅝ inches outside diameter and in pipe sizes ⅛ inch to 6 inches, standard, extra strong and double extra strong weights.

Gloweld (electric welded) stainless steel tubing may be had in sizes ranging from ⅜ inch to 4 inches outside diameter inclusive, and in standard weight pipe sizes ⅛ inch to 2 inches, inclusive.

Your tubing needs may lie somewhere within the above ranges — whatever your requirements, Globe is qualified by experience and facilities to supply you with tubing of the quality and uniformity you demand.

GLOBE STEEL TUBES COMPANY, Milwaukee 4, Wisconsin

GLOBE TUBES

★ STAINLESS STEEL TUBES ★ PRESSURE TUBES ★ GLOBEIRON TUBING ★ GLOWELD TUBES
★ CONDENSER AND HEAT EXCHANGER TUBES ★ MECHANICAL TUBING

5025

A FORTUNE IN PATTERNS

This is one of our storage sections. ***Strenes Metal*** castings have been made from these patterns.

Here are patterns for forming and drawing dies used by many of the largest sheet metal fabricators . . . manufacturers of appliances, automobiles, bicycles, blowers, caskets, implements, tractors, trucks, vaults, etc.

Here are also patterns for ***Strenes Metal*** castings employed as parts of equipment . . . bushings, melting pots, pump housings and impellers, lathe beds, machine bases and the like.

When you visit our plant, you'll probably be surprised at the volume of ***Strenes Metal*** castings we pour from day to day.

Strenes Metal
DRAWING AND FORMING DIES

THE ADVANCE FOUNDRY COMPANY
100 SEMINARY AVENUE — DAYTON 3, OHIO

SHEAR IT CLEVERLY *with a* BEVERLY

CUTS . . . STRAIGHT—CURVES—ANGLES

Beverly Throatless Shears cut metal flatly—ACCURATE—no waste, no distortion. Made of finest steel—PROFITABLE—INEXPENSIVE! Will last a lifetime!

No. 1—cuts 14 gauge—wt. 18 lbs.

No. 2—cuts 10 gauge—wt. 35 lbs.

No. 3—(With ball bearing hold-down device) cuts 3/16 inch mild steel and 10 gauge stainless steel, weight 58 lbs.

THE BEVERLY SHEAR MFG. CO.
3004 W. 111th St., Dept. 4, Chicago 43, Ill.

10,000 TRADE NAMES

grease and dirt. American Optical Co., Southbridge, Mass.

Anti Friction: Belt conveyor idlers. Link-Belt Co., 305 N. Michigan Ave., Chicago.

Anti Friction: Belt dressing. Anti Friction Belt Dressing Co., 111 Cheapside Ave., Baltimore.

Antifriction Greases: Special greases for antifriction bearings operating at moderate and slow speeds. Gulf Oil Corp., Gulf Bldg., Pittsburgh.

Anti-Link: Lock washers. American Nut & Bolt Fastener Co., 2027 Doerr St., Pittsburgh.

Antipeel: Air hose. Ingersoll-Rand Co., 13 Broadway, New York 4.

Antisep: Self-emulsifying water-soluble coolant, antiseptically treated. E. F. Houghton & Co., 203 W. Lehigh Ave., Philadelphia 33.

Anti Slip: Belt dressing. Geo. Callahan & Co., Inc., Closter, N. J.

Anti Slip: Belt dressing. Nourse Oil Co., Kansas City.

Antoxide: Rust-inhibiting metal paint. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Antrstat: Adjustable electrical transformers. Ward Leonard, 31 South St., Mt. Vernon, N. Y.

A-O-66: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Apco: Emulsifying cutting oil. Apex Motor Fuel Co., 1403 W. North Ave., Chicago.

Apcolard: Cutting oil. Acme Refining Co., 3593 W. 56th St., Cleveland.

Apex: Low-carbon, hard-drawn bright wire used as border wire in bed spring units. Bethlehem Steel Co., Bethlehem.

Apex: Aluminum and aluminum alloys. Apex Smelting Co., 2539 W. Taylor St., Chicago.

Apex: CO_2 recorders. Uehling Instrument Co., 21 Vesper St., Paterson, N. J.

Apex: Emery wheel dressers. Apex Tool & Stamping Corp., 202 E. Walnut at Wallner, Louisville.

Apex: Grinders. American Hydraulic, Inc., Fond du Lac, Wisc.

Apex: Wire. Paramount Wire Co. Inc., 100 Bleeker St., New York.

Apex: High carbon steel for tools, drills. Lehigh Steel Co., 16 Bethune St., New York.

Apexior: Protective coatings for iron and steel. Dampney Co. of America, 60 Business St., Hyde Park, Boston.

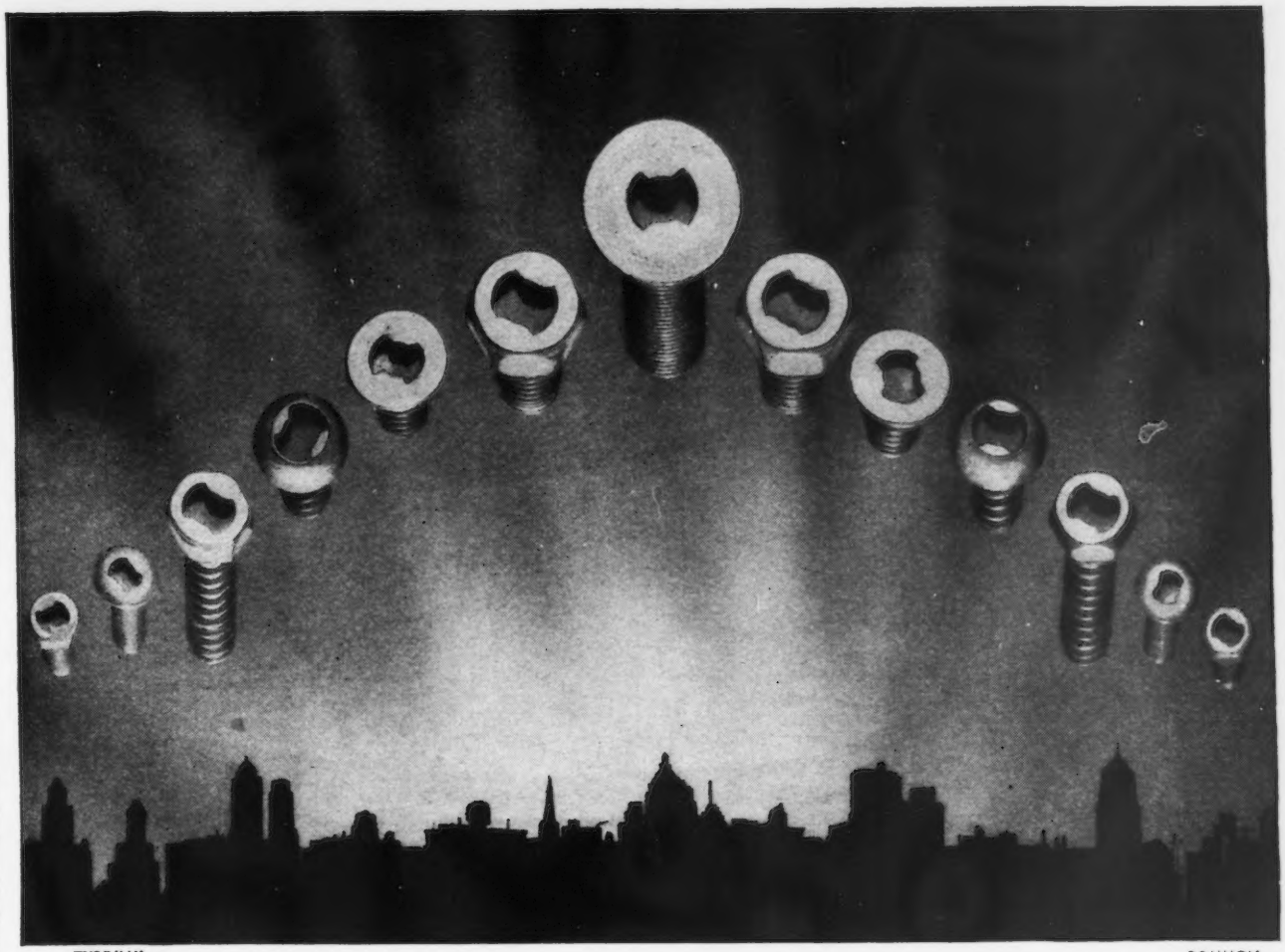
Apolloy: Low-carbon copper-bearing steel used for building constructions. Apollo Steel Co., Apollo, Pa.

Apolloy Metal: Steel sheets, hot-rolled or galvanized with copper content of approximately 0.20 pct for greater rust resistance. Apollo Steel Co., Apollo, Pa.

Appleton: Electrical products, outlet boxes and covers, switch boxes, conduit fittings, etc. Appleton Electric Co., 1701 Wellington Ave., Chicago 13.

APW Silver Solder: Alloy for silver solders. American Platinum Works, N. J. R. R. Ave at Oilver St., Newark, N. J.

Aquaseal: Plastic, non-corrosive waterproof joint compound used to seal natural or artificial gas, air, water and low pressure steam



TYPE "A" ASSEMBLY BIT

COMMON SCREWDRIVER

New Methods in industry impose new demands on assembly lines . . . for a new measure of economy through *faster, safer, easier,* and *better* production. Wherever power driving is used, the records show that CLUTCH HEAD Screws scale down the final costs with modern features and advantages which are *not matched by any other screw on the market today.*

VISIBILITY . . . The wide Clutch recess offers a clear, definite target, inviting confidence and unwavering action by the "greenest" operator. No "breaking-in" required.

SAFETY . . . The Center Pivot on the driver makes deep dead-center entry automatic. No canting, no slippage to injure manpower or damage materials.

EFFORTLESS DRIVING . . . The straight-sided driver squarely contacts the full area of the straight-walled Clutch to eliminate end pressure as a hazard and as a fatigue factor. With CLUTCH HEAD, there is no ride-out tendency as set up by "tapered" driving.

CLUTCH HEAD LOCK-ON . . . A slight reverse turn creates a friction-hold which unites screw and driver as a unit for easy one-handed reaching to hard-to-get-at spots. No slow-down fumbling. With field service Type "A" Bits, this feature functions automatically for easy withdrawal of screws, undamaged and saved for re-use.

NEW TOOL ECONOMY . . . .

Ruggedness of structure explains why this tool stands up through a longer continuous "spell" on the line. Repeated reconditioning to original efficiency requires only a 60-second application of the end surface to a grinding wheel.

CLUTCH HEAD SCREWS

SCREWDRIVER CONTROL . . .

This is the only modern screw engineered for operation with ordinary type screw drivers or any flat blade of reasonably accurate width. Thickness of the blade is secondary because the roomy Clutch permits a wide tolerance.

UNITED SCREW AND BOLT CORPORATION

CLEVELAND 2 CHICAGO 8 NEW YORK 7

joints. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Aqua-Set: Synthetic resin core binders for foundry use designed to bake out fast in a low oven. United Oil Mfg. Co., 1429-31 Walnut St., Erie, Pa.

Aquaset: Water dispersant and rust preventative. Waverly Petroleum Products Co., Drexel Bldg., Independence Sq., Philadelphia 6.

Aqua-Sol: Grinding, honing and lapping compounds. Wayne Chemical Products Co., 9501 Copeland Ave., Detroit.

Aquanol: Wetting agent. Beacon Co., 99 Bickford St., Boston.

Aquatower: Small, prefabricated, steel horizontal cooling tower sold as a package product for small water-cooling installations such as diesel engine cooling and air-conditioning work. Marley Co. Inc., 3001 Fairfax Rd., Kansas City, Kans.

Arabol: Adhesives for attaching labels to metals. Arabol Mfg. Co., 110 E. 42nd St., New York 17.

Aragum: Foundry core compounds. J. S. McCormick Co., 42 25th St., Pittsburgh.

Arbart: Speed reducer and gears. Abart Gear & Machine Co., 4835 W. 16th St., Chicago.

Arcaloy: Complete line of stainless-steel welding electrodes. Alloy Rods Co., York, Pa.

Arcast: Welding electrode for cast iron. C. E. Phillips & Co., 324 S. Jefferson St., Chicago.

Arcast: Welding electrodes. American Arc Welders, Inc., Roseau, Minn.

Arc-Craft: Complete line of arcwelding electrodes for steel. Allied Weld-Craft, Inc., 401 W. South St., Indianapolis 4.

Arcmaster: Controllers. Jeffrey Mfg. Co., 956-99 N. 4th St., Columbus, Ohio.

Arco: Aluminum ingots. Aurora Refining Co., Aurora, Ill.

Arco: High-aluminum brick. General Refractories Co., 111 S. Broad St., Philadelphia.

Arco: Lubricators and pneumatic tools. Arco Equipment Corp., 1941 Erie Ave., Bryan, Ohio.

Arcoloy: Copper alloy with Si, P for range boilers, storage tanks. American Radiator Co., 40 W. 40 St., New York.

Arcon: Rail bonds. American Steel & Wire Co., Cleveland 13.

Arco Rinkle: Crinkle enamels. Arco C., Bessemer & Clarke Sts., Cleveland.

Arctic: Babbitt metal. Sweet & Doyle Sts., Cohoes, N. Y.

Arctic: Bronze bearings, etc. National Metal Bearings Corp., 5000 Manchester Ave., St. Louis.

Arctic: Bronze car and locomotive bearings. American Brake Shoe Co., 230 Park Ave., New York 17.

Arctrol: Welding controls. Mullenbach Electrical Mfg. Co., 2302 E. 27th St., Los Angeles.

Arc-Wel: Nonferrous welding rod. Northeast Metals Co., Torresdale & Paul Sts., Philadelphia.

Arc-Weld: Rail bonds. American Steel & Wire Co., Cleveland 13.

Ardal Metal: Aluminum alloy with 2 Cu, 1.7 Fe, 0.6 Ni; for bearings, pistons, wire, tubes. Ardal Ltd., Weston-Super-Mare, England.

Ardite: Electrodes for the hard surfacing of steel. ARC Mfg. Co. Ltd., Goldhawk Road, London, W 12, England.

Ardometer: Pyrometers. Bristol Co., 117 Bristol Rd., Waterbury, Conn.

Aremite: Synthetic cast iron used for pipes, fittings, hardware. Robbins & Meyers, Inc., 1936 Clark Blvd., Springfield, Ohio.

Areskap: Wetting and emulsifying agents. Monsanto Chemical Co., 1702 S. Second St., St. Louis.

Aresket: Wetting agents. Monsanto Chemical Co., 1702 S. Second St., St. Louis.

Aresklene: Wetting and emulsifying agents. Monsanto Chemical Co., 1702 S. Second St., St. Louis.

Argon: Refractory materials. Vitrefrax Corp., 5052 Pacific Blvd., Los Angeles.

Argus: Anti-friction babbitt. Nassau Smelting & Refining Co., Inc., 1441 Willard St., Tottenville, S. I., N. Y.

Arguto: Oilless bearings. Arguto Oilless Bearing Co., 143-153 W. Berkley St., Philadelphia.

Aristaloy: High silver-tin alloy with Cu-Zn for dental amalgams and dies. Baker & Co., 115 Astor St., Newark 5, N. J.

Aristocrat: Genuine babbitt. Car-Mor Metal Co., Inc., Gaul & Gordon Sts., Philadelphia.

Aristoloy: Electric-furnace tools, aircraft quality, bearing quality, tool, stainless, nitralloy and specialty steels. Copperweld Steel Co., Warren, Ohio.

Ariston: Metal and die-cast bearings. Ariston Metal Co., 53 E. 42nd St., New York.

Ark-Ace: Firebrick. Laclede-Christy Clay Products Co., Ambassador Bldg., St. Louis.

Arl-Dietert: Spectographic Equipment. Harry W. Dietert Co., Roselawn at Westfield, Detroit.

Armascastings: Steel castings. Union Steel Castings Div. of Blaw-Knox Co., 62nd & Butler Sts., Pittsburgh 1.

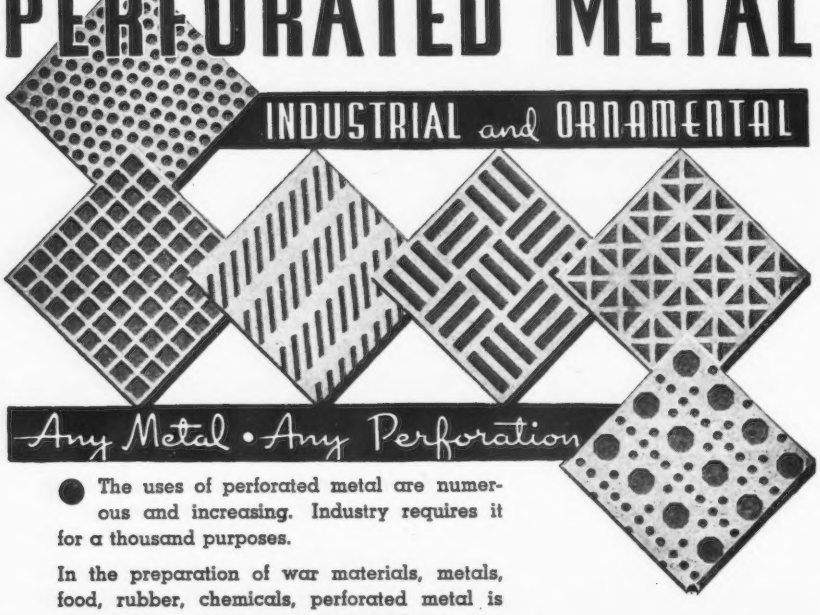
ArMa Steel: Iron alloy with 2.6 C, 1.2 Si, 0.15S for castings, gears, rocker arms, camshafts. Saginaw, Malleable Iron Div., General Motors Corp., Saginaw, Mich.

Armature: Silicon-iron magnetic core material; extremely ductile, good high density magnetic permeability. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh.

Armature: Babbitt metal. National Bearing Metals Corp., 5000 Manchester Ave., St. Louis.

PERFORATED METAL

INDUSTRIAL and ORNAMENTAL



Any Metal • Any Perforation

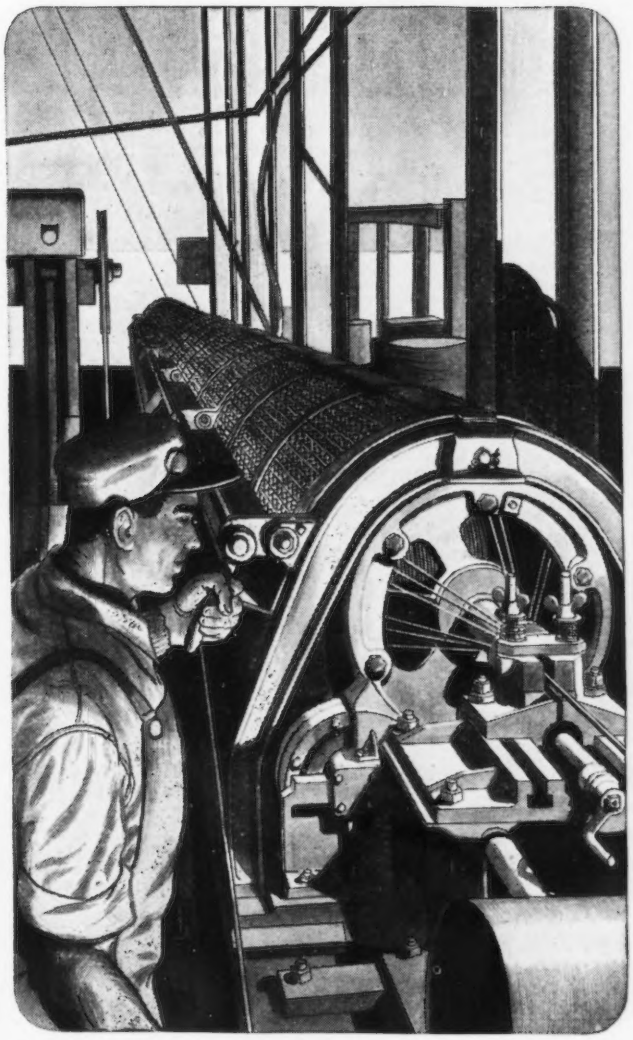
● The uses of perforated metal are numerous and increasing. Industry requires it for a thousand purposes.

In the preparation of war materials, metals, food, rubber, chemicals, perforated metal is required to perform an important role.

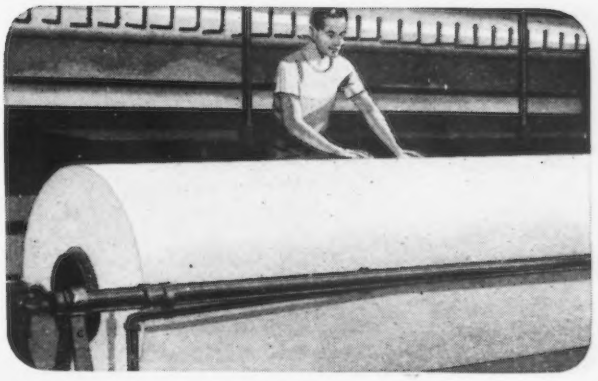
The Harrington & King PERFORATING Co.

5657 FILLMORE STREET—CHICAGO 44, ILL.
Eastern Office, 114 Liberty Street, New York 6, N. Y.

Watch industry Fluid-Drive* ahead!



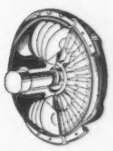
1 Cable Manufacturing. Looking for savings? Standard, constant speed AC motors gain new flexibility when equipped with Gýrol Fluid Drive. A vortex of oil takes up the load smoothly—pulls evenly from dead stop to full speed—protects equipment against overloads.



2 Paper. Gýrol Fluid Drive has helped paper manufacturers to simplify equipment and to cut maintenance costs. In this industry Fluid Drive is used to transmit power to slitters, coaters, draft fans, rewinders and conveyors.

3 Plastics. You get adjustable speed control at its best with Gýrol Fluid Drive on extruders, pumps, fans, rotary driers, agitators, crushers and compressors. Here's faster, easier selection of the most efficient speed for a given process.

4 And You? We firmly believe that industry has only started to explore the uses for Gýrol Fluid Drive. *Quite possibly you can find profitable new uses in your plant, processes or product.* Why not investigate the matter with our engineers?



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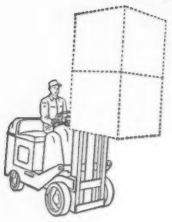
Division of American Radiator & Standard Sanitary corporation

* ***Gýrol Fluid Drive*** *is a fluid power transmission pioneered and developed for American industry by American Blower. It is used wherever smooth transmission of power or adjustable speed control is desired. Looking beyond the long list of applications already developed, we will gladly work with you to find new ways to "Fluid-Drive Ahead!"*



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10,000 TRADE NAMES

Armelec: Armature grade electrical steel sheets. Empire Steel Corp., Mansfield, Ohio.

Armglo: Resistance welders. Armglo Co., 3610 W. Pierce St., Milwaukee.

Armo: Electrical insulating materials. Allied Rubber Mica Co., 1430 W. 3rd St., Cleveland.

Armorarc: Arcwelding electrode for armor plate. Alloy Rods Co., 501 W. Prospect St., York, Pa.

Armor Clad: Soldering tips. Stanley Tools, 195 Elm St., New Britain, Conn.

Armor-Craft: Arcwelding electrode for armor plate. Allied Weld-Craft, Inc., 401 W. South St., Indianapolis 4.

Armorize: Protective paint. Carter Paint Co., Liberty, Ind.

Armorize: Arcwelding electrodes for armor plate. Crucible Steel Co. of America, 405 Lexington Ave., New York.

Armorlac: Lacquer finishes. J. L. Armitage & Co., Thomas & Dawson Sts., Newark, N. J.

Armorlikt: Steel cables. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Armorlock: Electric-welded pipe. Pacific Coast Engineering Co., Alameda, Calif.

Armorod: Arcwelding electrode for armor plate. Hollup Corp., 4700 W. 19th St., Chicago 50.

Armortex: Plastic paints. Cook Paint & Varnish Co., Kansas City, Mo.

Armortite: See Hazard.

Armorweld: Arcwelding electrode for armor plate. Lincoln Electric Co., 12818 Coit Road, Cleveland 1.

Armouring: Grating to be embedded in upper surface of concrete floors. Irving Subway Grating Co. Inc., 27th St. and 51st Ave., Long Island City 1, N. Y.

Armoweld: Electrical insulating materials. Allied Rubber & Mica Co., 1430 W. 3rd St., Cleveland.

Armourite: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Armstrong: Clamps, tool holder, cutters, tool holders, drill sleeves, lathe tools, drill vises, wrenches, ratchet drills, lathe dogs, setting up tools, machine shop spec. Armstrong Bros. Tool Co., 373 N. Francisco Ave., Chicago.

Armstrong's Insulating Cement: Expansion coefficient of dried cement similar to that of the brick; used for laying insulating firebrick in heating and melting furnaces. Armstrong Cork Co., Lancaster, Pa.

Armstrong: Gages, grinders, saw tools, etc. Armstrong Mfg. Co., Portland, Ore.

Armstrong: Pipe, conduit and bolt threaders, hinges and chain vises, pipe cutters, pipe taps, tube cutters. Armstrong Mfg. Co., 333 Knowlton St., Bridgeport, Conn.

Arnite: Insulating firebrick. Refractory & Iusulation Corp., 118 Wall St., New York.

Arnold: Counterbores, reamers, keyway cutters, countersinks. Arnold Tool Co., 14460 Euclid Ave., Cleveland.

Arnold: Grinding gages. Fisk Tool Co., Flint, Mich.

Arrow: Firebrick. Richard C. Remmey Son Co., Hedley & Delaware River, Philadelphia.

Arrowblast: Granular abrasive material used for blasting, carving and cutting purposes. Norton Co., Worcester 6.

Arsenical Admiralty Tubing: Brass with 0.03 As for condenser tubing. Bridgeport Brass Co., Bridgeport, Conn.

Arteraft: Soldering fluid. Reade Mfg. Co. Inc., 195 Hoboken Ave., Jersey City.

Art Die: High-carbon low-alloy tool steel used for jewelers dies. Columbia Tool Steel Co., Chicago Heights, Illinois.

Arter: Grinders. Arter Grinding Machine Co., Grove & Sagamore Road, Worcester.

Artisan: Soldering flux. C. M. Hoover Laboratories, 315 Elmwood Ave., Newark, N. J.

Artnamel: Enamels. Artic Chemical & Combustion Engineering Corp., 211-213 King St., Brooklyn.

Arundel: Foundry core ovens. Monarch Engineering & Mfg. Co., Curtis Bay, Baltimore.

Arusteo: Anti-rust paints. Anti-Rust Paint Co. of La., Felicity & Celeste Sts., New Orleans.

Arzade: Alloy iron. Arcade Malleable Iron Co., Nebraska & Muskeego Sts., Worcester.

Arzite. Alloy iron. Arcade Malleable Iron Co., Nebraska & Muskeego St., Worcester.

Arzite Metal: Corrosion-resistant malleable iron for castings. Arcade Malleable Iron Co., Worcester.

Arzon Metal: Close-grained white cast iron with Si-Mn; for malleable iron castings, fittings, plumbings. Arcade Malleable Iron Co., Nebraska & Muskeego Sts., Worcester.

Asarcoloy: Cadmium alloy with 2 Ni, for bearings in severe service. American Smelting & Refining Co., Perth Amboy, N. J.

Asbestocel: Sheets, blocks and pipe insulation. Johns-Manville, 24 E. 40th St., New York 16.

Asbestos-Bonded Sheets: Zinc-coated steel sheets with asphalt-impregnated asbestos-bonded coating. Used where metal is in constant contact with water, acids or alkalies. American Rolling Mill Co., 303 Armco Ave., Middletown, Ohio.

Ascholite: Abrasion-resistant pipe. Allen-Sherman-Hoff Co., 1427 Locust St., Philadelphia 2.

Ascoloy: See Allegheny Metal.

Asheo: Firebrick. North American Refractories Co., 613 Euclid Ave., Cleveland.

Ashland: High heat duty fireclay brick. North American Refractories Co., 1012 National City Bank Bldg, Cleveland 14.

Asko: Shear knives for plate, bar and alligator shears; also tinning-machine rolls. American Shear Knife Co., Homestead, Pa.

Asplit: Cold-setting resin cement for acid-proof tile brick to resist abrasion and non-oxidizing conditions. Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7.

Atc: Time controls and motorized valves, burners and dampers. Automatic Temperature Control Co. Inc., 34 E. Logan St., Philadelphia 44.

Atco: Welding rods. Atlas Foundry Co., W. 69th & Denniston Ave., Cleveland.

Athletic Hilo: Spelter or slab zinc. Athletic Mining & Smelting Co., Joplin, Mo.

Atlantaloy: Two brasses and one Cu-Al alloy for castings. Atlantic Casting & Engineering Co., Clifton, N. J.

Atlantic: Metal cutting band saws. Atlantic Saw Mfg. Co. Inc., 158 Brewery St., New Haven, Conn.

Atlantic: Screw-machine steel. Bethlehem Steel Co., Bethlehem, Pa.

Atlantic First: Firebrick. Atlantic Refractories Co., Macon, Ga.

Atlas: Arbor presses, metal lathes, metal shapers & drill presses, portable coolant pumps, milling machinery, multiple spindle drill press. Atlas Press Co., 1773 North Pitcher, Kalamazoo, Mich.

Atlas: Bolts, nuts, screws, rivets, studs, pins. Atlas Bolt & Screw Co., Ivanhoe & Welt Rds., Cleveland.

Atlas: Braided wire rope, slings. Macwhyte Co., 2936 14th Ave., Kenosha, Wisc.

Atlas: Die impression steel forgings. Atlas Drop Forge Co., Lansing 2, Mich.

Atlas: Spoke wire. American Steel & Wire Co., Cleveland 13.

Atlas: Small rivets. Atlas Tack Corp., 1079 Pleasant St., Fairhaven, Mass.

Atlas: Welding rods. Atlas Stainless Steel Castings Div. of Atlas Foundry Co., 501 Lyons Ave., Irvington, N. J.

Atlas Sling: Sling of alternate lay wire ropes braided in a round body. Macwhyte Co., 2911 14th Ave., Kenosha, Wisc.

Atlas Superior: Bronze. Atlas Brass Foundry, Sante Fe & 11th St., Los Angeles.

Atom: Pneumatic portable tools. Buckeye Tools Corp., Dayton.

Atomist: Lacquer sprayers. E. C. Brown Co., 900 Maple St., Rochester, N. Y.

Atticvane: Ventilating fans. Westinghouse Electric Corp., East Pittsburgh, Pa.

A-12: Silicon-aluminum alloy. Precision Castings Co. Inc., Orchard St., Fayetteville, N. Y.

Audio Transformer: Silicon-iron magnetic core material; high permeability at low flux densities, good stamping properties. Allegheny Ludlum Steel Co., Oliver Bldg., Pittsburgh.

Aufriley: Cu, Pb, Sn alloy for bearings, bushings. Wellman Bronze and Aluminum Co., 2525 E. 93 St., Cleveland.

Aurand: Surface cleaning tools and commutator slotters. Aurand Mfg. & Equipment Co., Straight St. & Colerain Ave., Cincinnati.

Auriga: Lubricating oil. Texas Co., 135 E. 42 St., New York.

Aurochs: Conveyor belts. Boston Woven Hose & Rubber Co., Conder and Kingston Sts., Cambridge, Mass.

Aur-O-Met: Aluminum-bronze die castings produced by a vacuum-casting process. Aurora Metal Co., 614 W. Park Ave., Aurora, Ill.

Aurora: Centrifugal pumps. Aurora Pump Co., 1198 Loucks St., Aurora, Ill.

Aurora: Drilling machines. Aurora Tool Works, 4424 Appleton St., Cincinnati.

Aurora: Valve grinders. G. A. Schipper Co., 327 State Bank Bldg., Aurora, Ind.

Austalon: Investment-cast stainless similar in analysis to stainless No. 317. Used for dentures. Also available in wire for orthodonic applications. Austenal Laboratories, Inc., 224 E. 39th St., New York 16.

Austempered: Special heat-treated wires. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Austempering: Method of heat treating to increase toughness of steel while retaining considerable hardness. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh.

Austenal Porcelain: Porcelain material for artificial teeth. Austenal Laboratories, Inc., 224 E. 39th St., New York 16.

Autochemic: Fluxes for the welding at low heats of aluminum and aluminum alloys, cast iron, steels, copper alloys, nickel alloys, and magnesium alloys. Eutectic Welding Alloys Corp., 40 Worth St., New York 13.

Autocrat Bronze: Bronze for bearings and bushings. United American Metals Corp., 204 Diamond St., Brooklyn.

Autodyne: Electrical remote controls. Westinghouse Electric Corp., East Pittsburgh, Pa.

Auto-Klean: See Micro-Klean.

Automatic Rise and Fall: Automatic-bed type milling machine with automatic vertical travel of spindle carrier. Cincinnati Milling Machine Co., Marburg Ave., Cincinnati.

Autometric: Precision boring machines. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14.

Autotorque: Remote indicating and control systems. Gianni, G. M. & Co., Inc., 163 E. California St., Pasadena, Calif.

Autovalve Steel: Corrosion-resistant 30 Ni bearing steel for valves, spark plugs. Carpenter Steel Co., Reading, Pa.

Autoveyor: Automatic trolley bucket systems. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Avesta: Complete series of stainless steels for shafts, cutlery, chemical apparatus, valves. Avesta Iron & Steel Works, Avesta, Sweden. A. Johnson & Co., Inc., 630 Fifth Ave., New York.

Avey: Ball bearing drilling machines. Avey Drilling Machine Co., Inc., Cincinnati 1.

Avialite: Copper alloy with 9.5 Al for valve seats, spark-plug bushings in aircraft engines. American Brass Co., Waterbury, Conn.

Avional: Corrosion resisting aluminum alloys with high Cu, low Mg-Mn-Fe-Si for aviation and automobile parts. Aluminum Industrie A. G., Neuhausen, Switzerland; Lavarazione Leghe Leggere, Milano, Italy.

Axaloy: Plain-carbon steel for truck axles. Timken Detroit Axle Co., 100 Clark St., Detroit.

AX Gas: Dissociated ammonia atmosphere for bright annealing stainless steel. Surface Combustion Corp., Toledo 1.

Axelson: Deep well plunger pumps, sucker rods, plain and thread plug and ring gages, heavy duty engine lathes, tool room lathes, gray iron and alloyed castings. Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 11.

Axiaflo: Circulators for handling brine at low pressure heads, primarily for circulating brine in ice-making operation; also, vertical direct-driven propeller type machines for agitating low-viscous liquids, such as water, brine or light oil, and certain chemicals. Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2.

Axlo: Shock-resistant steel for crankshafts, gears, die blocks. Industrial Steels Ltd., Sheffield, England.

Axloy: Series of cast irons with Si-Mn, Ni, Ni-Cr-Mo; for hydraulic cylinders, valves, liners, cams, cylinder blocks. Axelson Mfg. Co., Boyle & Randolph Sts., Los Angeles.

Axtex: Firebrick. Mexico Refractories Co., Mexico, Mo.

— B —

B.A./40D: Aluminum alloy with 10-13 Si for light alloy parts and corrosion resistant castings. Arthur Seligman & Co., 42 W. 49th St., New York.

BA 21: Medium strength non-heat-treated light alloy for marine work, rolling stock, furnitures, etc. British Aluminium Co., Ltd., Salisbury House, London Wall, London E. C. 2, England.

B&B: Wire rope, and wire rope braided safety slings. Broderick & Bascom Rope Co., 4203 N. Union Blvd., St. Louis 15.

B&K: Heavy, power-driven pipe threading and cutting machines. Bignall & Keeler, Machine Works, Edwardsville, Ill.

B.P.: Rivet wire. American Steel & Wire Co., Cleveland 13.

BRB Powdered Lubricant: Drawing compound with unusual lubricating properties; reduces or eliminates cleaning of parts. Wayne Chemical Products Co., 9500 Copeland Ave., Detroit 17.

BTC: Forgings and stampings. Brewer-Titchener Corp., Cortland, N. Y.

B.&W.: Series of heat and corrosion resisting chrome and chrome-nickel steels for oil refinery equipment, paper industry use, heat resisting parts. Babcock & Wilcox Tube Co., Beaver Falls, Pa.

BW Prints: Equipment for black or colored line prints on a white or tinted background, reproduced from transparent or translucent originals. Charles Bruning Co. Inc., 4754 Montrose Ave., Chicago 41.

B-Way Pallet: Steel wire pallet with a heavy, open wire mesh decking that can be lifted with the ordinary lift truck from eight different directions. Union Steel Products Co., Albion, Mich.

Babiflux: Prevents segregation when plunged into molten babbitt before casting; assures homogeneous mixture. United American Metals Corp., 200 Diamond St., Brooklyn 22.

Babisave: Releases the tin imprisoned in babbitt dross thereby holding the babbitt to its original balanced formula. United American Metals Corp., 200 Diamond St., Brooklyn 22.

Bachite: Method of coating and coloring carbon and stainless steels. Oscar B. Bach. Studios, Inc., 610 Fifth Ave., New York.

Baco: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Badger: Malleable iron castings, iron clevises and stake irons, malleable iron detachable chain, and tractor jacks. Badger Malleable & Mfg. Co., South Milwaukee, Wis.

Baffle Crete: Firebrick. Mexico Refractories Co., Mexico, Mo.

Bafflemix: Castable refractory. Laclede-Christy Clay Products Co., Ambassador Bldg., St. Louis 1.

Bafflemix: Castable refractory. North American Refractories Co., 1012 National City Bank Bldg., Cleveland 14.

Bahnaluminium: Aluminum alloy with 6 Cu, for light-alloy parts. Allgemeine Elektrizitats Gesellschaft, Berlin, Germany.

Bailey: Pulverized coal furnaces and feeders; furnace bottoms. Babcock & Wilcox Co., 87 Liberty St., New York 6.

Bailey Duplicator: See Air-Tracer.

Bain Steel: Complex, low alloyed steel with Cr-Mo-Si-Mn, for heat-resistant castings and tubing. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh.

Bakadie: Iron alloy for bakelite molds and dies. Braeburn Alloy Steel Co., Braeburn, Pa.

Bakelite: Thermosetting phenolics, and thermoplastic polystyrenes and polyethylenes; molding materials; extrusion compounds; sheeting and film; resin baking coatings; impregnating, calendering, and bonding materials; technical cements. Bakelite Corp., 300 Madison Ave., New York 17.

Baker: Electric industrial trucks, tractors and cranes. Baker-Raulang Co., 2168 W. 25th St., Cleveland 13.

Baker Perfect: Barbed wire. American Steel & Wire Co., Cleveland 13.

Balance: Chains. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Balancer: Sensitive electronic control relay, inter-wired in the slidewire circuit existing between a potentiometer type control instrument and a positioning motor for regulating valves, burners or dampers, providing proportioning control with automatic reset action. Automatic Temperature Control Co. Inc., 34 E. Logan St., Philadelphia 44.

Balco: Magnetic nickel with 2.5 Fe for voltage resistors. Wilbur B. Driver Co., Newark, N. J.

Bal-Co-Mul: Emulsion for temporary protective coating of pipe and other steel products during finishing operations and warehousing. Ball Chemical Co., Fulton Bldg., Pittsburgh 22.

Balcut: Series of free-machining steels for gears, shafts. Bliss & Laughlin, Inc., Harvey, Ill.

Banbury: Mixers. Farrel-Birmingham Co., Inc., Main & State Sts., Ansonia, Conn.

Banner: First quality dry-press firebrick. Chicago Fire Brick Co., 1467 Elston Ave., Chicago 22.

Banner: Poultry fence, steel fence posts. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Banroc: Mineral wool insulation. Johns-Manville, 24 E. 40th St., New York 16.

Bantam Bully: Small powerful pneumatic hammer. Superior Flux Co., 913 Public Square Bldg., Cleveland.

Baral: Aluminum-barium alloys for getters in electronic tubes. Calloy Ltd., Avonmouth, England.

Barberite: Nickel-bearing bronze for marine parts, ornaments, fixtures. Barber Asphalt Corp., Barber, N. J.

Barmag: Barium-magnesium alloys for getters in electronic tubes. Calloy Ltd., Avonmouth, England.

Barnesdrill: Metal drilling machines. Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

Barnstead: Water demineralizers. Barnstead Still and Sterilizer Co., Inc., 63 Lanesville Terrace, Forest Hills, Boston.

Barohm: Channel shaped ribbon resistor. Ward Leonard, 31 South St., Mt. Vernon, N. Y.

Baros: Heat-resisting 90-10 Ni-Cr alloy for penpoints and balance weights. Soc. Anon. de Commentry Fourchambault et Decazeville, Paris, France; R. Y. Ferner Co., Investment Bldg., Washington.

Barronia Metal: Alloy of 83 Cu, 4 Sn, 13 Zn for condenser tubes, evaporators, fittings. Barronia Metals, Ltd., London, England.

Barrow Brand: Pig iron. Barrow Haematite Steel Co., Ltd., Barrow-in-Furness, Lancashire, England.

Barrow S.P. Iron: High silicon-phosphor-manganese iron for cylinders, valves, pumps, steam chests. Barrow Haematite Steel Co., Ltd., Barrow-in-Furness, Lancashire, England.

Bartley: Nut and bolt fasteners. American Nut & Bolt Fastener Co., 2027 Dover St., Pittsburgh.

Basche Metal: High copper-aluminum alloy with Ni-Mg-Mn, for heat-treated chilled castings. Niagara Falls Smelting & Refining Corp., Buffalo.

Basifrit: Quick-setting high-magnesia refractory for construction, repair and resurfacing of basic openhearth furnace bottoms. Basic Refractories, Inc., 845 Hanna Bldg., Cleveland 15.

Basolit: Sulphur-silica compound used for jointing cement for acid proof tank and floor construction. Nukem Products Corp., 122 Colgate Ave., Buffalo 20.

Batterium: Alloy of 89 Cu, 9 Al and 1 Ni for chemical apparatus, valves, plug cocks. Batterium Metal & Vislok, Ltd., Market Harborough, England.

Bauer-Vogel: German process for protective oxide film on aluminum and aluminum alloys. Aluminum Co. of America, Pittsburgh; Reynolds Metal Co., Louisville.

Baush Casting Metal: Corrosion-resistant Al-

Ni-Cu casting alloy for heat treating castings. Baush Machine Tool Co., Springfield, Mass.

Bay State: Full line of abrasive products. Bay State Abrasive Products Co., Westboro, Mass.

Bayflex: Resilient abrasive type wheel which combines cotton fiber and abrasive into a bonded abrasive product. Bay State Abrasive Products Co., Westboro, Mass.

Bazar: Nickel silver with 10 Ni for domestic utensils, ornaments. Barker & Allen, Ltd., Birmingham, England.

Bearite: Antimonial lead with hardener for bearings not subject to vibration or pounding. A. W. Cadman Mfg. Co., 2810 Smallman St., Pittsburgh 22.

Bearium: Cast copper-lead-tin bearing alloy for light-service antifriction purposes. Bearium Metals Corp., 262 State St., Rochester, N. Y.

Beaver: Pipe and bolt cutting and threading tools and machines; sawing vises and threading oil. Beaver Pipe Tools, Warren, Ohio.

Beaver Babbitt: For all bearings except those operating under extreme speed and shock. United American Metals Corp., 200 Diamond St., Brooklyn 22.

Bedco: Hard and tough general purpose alloy steel. Bedford Tool & Forge Co., 22 Interstate St., Bedford, Ohio.

Bedel: Series of medium-alloy steels for crankshafts, case hardened parts and engineering construction; also highly alloyed heat and corrosion-resistant cast stainless for furnace parts. Bedel & Ci., Paris, France.

Beechwood: Lime polishing composition. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Belais White Gold: Gold with 8-18 Ni, 2-14 Zn for jewelry and ornaments. H. A. Wilson Co., 103 Chestnut St., Newark, N. J.

Belectric: Electric furnace gray iron of constant physical properties of a specific nature. Belle City Malleable Iron Co., Racine, Wis.

Belectromal: Alloy high strength malleable iron with ferritic matrix. Belle City Malleable Iron Co., Racine, Wis.

Belectromal: Malleable iron with high strength without sacrificing ductility and machinability. Belle City Malleable Iron Co., 1444 Forest Ave., Racine, Wis.

Bellowseal: Serrated metal gasket so constructed that the line pressure assists in maintaining a tight seal. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J.

Belltite: Quick setting, acid proof cement, designed particularly for jointing clay and concrete sewer pipe. Nukem Products Corp., 122 Colgate Ave., Buffalo 20.

Belmalloy: Pearlitic malleable iron of psi tensile strength. Belle City Malleable Iron Co., Racine, Wis.

Bemal: 70-30 brass for condenser tubes. Yorkshire Copper Works, Ltd., Leeds, England.

Bending: Universal pipe, bar and angle iron bender, hand operated. Hossfeld Mfg. Co., Winona, Minn.

Benedict Nickel: Corrosion-resistant copper with 20 Ni, Fe available in sheets, tubes, extruded parts. American Brass Co., Waterbury, Conn.

Benson: Bearing babbitt. Hewitt Metals Corp., 1918 Stanly St., Detroit.

Benzogas: Equipment for making high-calorific producer gas. International Furnace Equipment Co., Ltd., Aldridge, Staffs, England.

Beraloy: Copper alloy with 2.0 Be, 0.25 Co for springs, electric contacts, diaphragm valves, bearings. Wilbur B. Driver Co., Newark, N. J.

Berdo: Series of bronzes containing Cu, Sn, Pb, Ni used for heavy, general and light service bearings. Barronia Metals, Ltd., London, England.

Bergal: Aluminum alloy with Cu-Mg-Mn-Si for light-alloy parts. Bergman Electrizitatswerke, Berlin, Germany.

Bermalloy: Pearlitic malleable cast iron for tractor parts, axle parts. Belle City Malleable Cast Iron Co., Racine, Wis.

Bermax: High-lead babbitt, not subject to oil corrosion; particularly recommended for rebabbitting steel-back or bronze-back bearings or housings of cast steel or cast bronze; used for automotive Diesel engine, pump and compressor units. Federal-Mogul Corp., 10,000 Shoemaker Road, Detroit 13.

Berylco: Alloys (usually copper) containing 0.1 to 4 pct beryllium. Beryllium Corp., Reading, Pa.

Beryl-Trode: Coated beryllium-copper electrodes for metallic-arc or carbon-arc process. Ampco Metal Co., Inc., 1747 S. 38th St., Milwaukee 4.

Berrydur: High-nickel alloy with Cr-Fe-Mn-Mo and 0.5 beryllium for stainless parts. Heraeus-Vacuumschmelze A.G., Hanau, Germany.

Besplate: Nickel for anodes. McGean Chemical Co., Republic Bldg., Cleveland.

Bethadur: Series of straight-chromium stainless steels for exterior trim, cold rivets, tanks, ball bearings, cutlery. Bethlehem Steel Co., Bethlehem.

Bethanize: Electrolytically zinc-coated wire and other steel products. Bethlehem Steel Co., Bethlehem.

Bethalon A: Stainless steel with 14 Cr for automatic and screw machine parts. Bethlehem Steel Co., Bethlehem.

Bethco: Special cold-heading steel for machine and wood screws. Bethlehem Steel Co., Bethlehem.

Beth-Co-Lite: Hot-dipped tinplate. Bethlehem Steel Co., Bethlehem.

Beth-Co-Weld: Continuous-weld steel pipe. Bethlehem Steel Co., Bethlehem.

Beth-Cu-Loy: Copper-bearing steel, for pipe, sheets and other products. Bethlehem Steel Co., Bethlehem.

Bethalon: Free-machining stainless steels. Bethlehem Steel Co., Bethlehem.

Bethanized: Electrogalvanized products with a pure, very ductile zinc coating firmly bonded to the steel base; obtainable in very heavy coatings. Bethlehem Steel Co., Bethlehem.

Bethco: Barbed wire; machine screw wire and wood screw wire. Bethlehem Steel Co., Bethlehem.

Bethelductor: High-tensile Bethanized wire for telephone and telegraph service. Bethlehem Steel Co., Bethlehem.

Bethlehem No. 1222: Positive-type switch stand for confined locations where lowness and ease of operation are essential. Bethlehem Steel Co., Bethlehem.

Bethlehem Positive Switch Stand: Positive action stand for main railroad line service. Bethlehem Steel Co., Bethlehem.

Bethloc: Lowcarbon, high-ductility basic steel plates for standard railroad boiler-flange and fire-box specifications. Bethlehem Steel Co., Bethlehem.

Beyl: Friction clutches. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

B.H.T.A. Metal: Duralumin-type Cu-Ni-Fe-Mg-Si aluminum alloy for light-alloy parts and forgings. Jas. Booth & Co., Ltd., Birmingham, England.

Big Chief Babbitter: Designed for melting and casting babbitt into bearing shells. United American Metals Corp., 200 Diamond St., Brooklyn 22.

Billeteer: Machine for chipping and conditioning steel billets. Bonnot Co., Canton 2, Ohio.

Birmabright: Corrosion resisting aluminum alloy with Mg and Mn available in sheets, tubes, rivets, bolts. Birmabright, Ltd., Birmingham, England.

Birmal: Cast aluminum alloy with Mg-Mn for light alloy parts. Birmingham Aluminium Casting Co., Ltd., Birmingham, England.

Birmasil: Fe-Si diecast alloy for light-alloy castings. Birmingham Aluminium Casting Co., Ltd., Birmingham, England.

Birmetal: Aluminum-alloy extrusions. Birmetals, Ltd., Birmingham 32, England.

Birmidium: Corrosion-resistant aluminum alloy with Cu-Mg-Ni, for pistons, crankcases, oil engine parts. Birmingham Aluminium Casting Co., Ltd., Birmingham, England.

Birmidium Y Alloy: Aluminum alloy with Cu-Ni-Mg for automobile pistons, piston heads, crankcases. Birmabright, Ltd., Birmingham, England.

Birso: Nonferrous castings, centrifugally-cast gear blanks, ingot metals. T. M. Birkett & Sons, Ltd., Hanley, Staffs, England.

Bisector: Metal surveying instrument used to locate correct position at which telephone pole guying anchors should be spotted in ground. W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44.

Bitumastic: Coal-tar base coating for protecting metal or concrete against powerful corrosive forces. Wailes Dove-Hermiston Corp., Westfield, N. J.

Bituplastic: Coal-tar pitch in water suspension, for heavy duty protective coating against moisture, sunlight and chemicals. Wailes Dove-Hermiston Corp., Westfield, N. J.

Black Arrow: Paint spraying equipment; cutting and welding torches and allied equipment. Black Mfg. Co., 1416 W. Baltimore St., Baltimore 23, Md.

Black Beauty: Black coated sheet specially

adaptable in the manufacture of stoves, to replace hot-rolled sheets which require japanning. Empire Steel Corp., Mansfield, Ohio.

Black & Decker: Full line of portable electrical tools. Black & Decker Mfg. Co., Towson 4, Md.

Black Devil: Arcwelding electrodes for steel. Champion Rivet Co., Harvard Ave. & E. 108th St., Cleveland 5.

Blackor: Abrasion-resistant 87 W, 9 C hardfacing electrode. Lincoln Electric Co., 12818 Coit Rd., Cleveland.

Black Magic: Integral jet-black finish for carbon steels, zinc, copper, brass and cadmium. Mitchell-Bradford Chemical Co., 2444 Main St., Bridgeport, Conn.

Blackoat: Foundry mold coating compounds. Independent Foundry Supply Co., 2325 E. 38th St., Los Angeles 11.

Black Passivating: Dull black, wear-resisting finish 0.00001-in. thick for stainless steel. Stainless Surface Hardening Co., 255 Bent St., Cambridge 41, Mass.

Blackplate Lacquer: Organic coating with excellent adhesion to prevent underfilm corrosion; available in metallic colors. Watson-Standard Co., 227 Galveston Ave., Pittsburgh.

Black-White: Arcwelding electrode for steel: corresponds to AWS E-7020. American Agile Corp., 5806 Hough Ave., Cleveland 3.

Blacosolv: Stabilized trichlorethylene solvent for removing grease and oils from stamped, machined and fabricated metal parts, prior to painting, plating and other processes. G. S. Blakeslee & Co., 19th St. & 52nd Ave., Cicero Station, Chicago 50.

Blanchardize: Method of securing extremely close tolerances for flatness, surface finish, parallelism of dimensions on metal, glass, ceramics or semi-precious jewels and for rapid stock removal. Blanchard Machine Co., 64 State St., Cambridge 39, Mass.

Bliss: Power presses, mechanical and hydraulic; can making machinery and rolling mill equipment. E. W. Bliss Co., 53rd St., Brooklyn 32.

Blombit: Copper alloy with 5 Ag, for electrodes and spot welding tips. Allgemeine Elektrizitats Gesellschaft, Berlin, Germany.

Blue: Arcwelding electrode for steel; corresponds to AWS E-6011. American Agile Corp., 5806 Hough Ave., Cleveland 3.

Blue Bonnet: Bale ties. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Blue Brute: Pavers, rock drills, compressors, etc. Worthington Pump & Machinery Corp., Harrison, N. J.

Blue Center: Improved plow steel grade of wire rope having maximum strength and durability. John A. Roebling's Sons Co., Trenton 2, N. J.

Blueclad: Wire rope fittings, including drop forged weldless sockets, hooks, clips, etc., of extra-strength design. John A. Roebling's Sons Co., Trenton 2, N. J.

Blueclad No-Pinch: Wedge socket for wire rope or such design that pressure on live side of rope is limited. John A. Roebling's Sons Co., Trenton 2, N. J.

Bluedac: Arcwelding electrode for steel; corresponds to AWS E-6011. Champion Rivet Co., Harvard Ave. & E. 108th St., Cleveland 5.

Blue Devil: Arcwelding electrodes for steel. Champion Rivet Co., Harvard Ave. & E. 108th St., Cleveland 5.

Blue Devil Yoloy: Flux coated steel welding rod. Champion Rivet Co., Harvard Ave. & E. 108th St., Cleveland 5.

Blue Diamond: Steel for road machinery cutting edges. Northfield Iron Co., Northfield, Minn.

Blue Diamond: High-speed twist drills. Whitman & Barnes, Detroit 16.

Blue-Gray: Arcwelding electrode for steel: corresponds to AWS E-6030. American Agile Corp., 5896 Hough Ave., Cleveland 3.

Blue Label: See Raco.

Blue-Red: Arcwelding electrode for steel; corresponds to AWS E-6013. American Agile Corp., 5806 Hough Ave., Cleveland 3.

Blue Streak: Hand lift trucks. Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia 24.

Blue-Stripe: Silicon-carbide belt, sheet and general-purpose abrasives. Clover Mfg. Co., Norwalk, Conn.

Bob-Cat: Electric hoists in ½ to 2 ton capacities. Lisbon Hoist & Crane Co., Lisbon, Ohio.

Bodine: Automatic dial type drilling, milling, tapping and screw inserting machines. Bodine Corp., Bridgeport 5, Conn.

Bohler: Alloy steels for gages, staybolt taps, rifle barrels, chemical plant equipment. Bohler Bros. & Co., Vienna, Austria.

Bohn: Series of copper alloys with Sn-Pb-Zn or Pb-Ni, etc., for castings, impellers, bushings, bearings, wrist pins. Bohn Aluminum & Brass Corp., Lafayette Bldg., Detroit.

Boice-Crane: Band saws, planers for woodworking, circular saws, jointers, drill presses, jig saws, lathes for wood turning and metal spinning, belt sanders, drum sander, oscillating spindle sanders, shapers for woodworking. Boice-Crane Co., 930 W. Central Ave., Toledo.

Boloney: Bearing metal. Oman Non-Friction Metal Co., El Paso, Texas.

Boltons: Special alloy for bearings and bushings. Thos. Bolton & Sons, Widnes, England.

Bon White: Tin coatings, by quick immersion, on copper and brass, in which proprietary paste is added to sodium cyanide solution. Alrose Chemical Co., Providence 1.

Bondermetic: Metal to glass air-proof sealing process. Libbey-Owens-Ford Glass Co., Toledo.

Bondite: Organic binder for skin dry, dry sand and green sand molds and cores. Delta Oil Products Co., Milwaukee 9.

Bond Set: Silica-base high-temperature bonding mortar, particularly designed for hot patch work. Mexico Refractories Co., Mexico, Mo.

Bondur: Age-hardening aluminum alloy with about 4 Cu, Si-Mn-Mg for light alloy parts. Vereinigte Leichtmetall Werke, G.m.b.H., Hanover-Linden, Germany.

Bondurplate: Bonded aluminum plate for corrosion resistance in light-alloy parts. Vereinigte Leichtmetall Werke, G.m.b.H., Hanover-Linden, Germany.

Bonhalite: Series of magnesium alloys with Al-Mn and Cu-Cd or Mn-Sn for extrusions, castings, pistons, forgings. Bohn Aluminum & Brass Corp., Lafayette Bldg., Detroit.

Bonney-Floyd: Low-alloy medium-carbon steels for dipper teeth, gears, rollers, general structural parts. Bonney-Floyd Co., 613 Marion Road, Columbus, Ohio.

Booth: Series of highly alloyed brasses for extrusions. Jas. Booth & Co., Ltd., Birmingham, England.

Booth Cap Copper: 97.5 Cu with Zn alloy for small pressings. Jas. Booth & Co., Ltd., Birmingham, England.

Boothcote: Coating for paint booth, permitting paint to be peeled off in sheets. Hygrade Food Products Corp., 19 Stetson St., Buffalo 6.

Borden Gratings: Open-type flooring for industrial plants, power houses, refineries, factories, walks, platforms and stairs, all designs, types and sizes. Borden Metal Products Co., P. O. Box 172, Elizabeth, N. J.

Borium: Tungsten-carbide for hardness and abrasion resistance; used in welding rods, for hard surfacing. Stoody Co., Whittier, Calif.

Borod: Tungsten-carbide for hardness and abrasion resistance; used in welding rods, for hard surfacing. Stoody Co., Whittier, Calif.

Borolon: Fused crystalline aluminum-oxide abrasive, for grinding wheels for steel; and other materials of high tensile strength, also used in polishing and pressure blasting operations in grain form. Abrasive Co., Div. of Simonds Saw & Steel Co., Philadelphia 37.

Boronic Alloys: Boron alloys used as addition agents as deoxidizers in ferrous and nonferrous castings. American Boron Products Co., Kenmore Station, Buffalo.

Borosil: Alloy containing 3 to 6 pct Bo, 40 pct Si, balance iron for making boron additions to steel. Ohio Ferro-Alloys Corp., 104 Citizens Bldg., Canton 2, Ohio.

Bortam: Ferroalloy containing B, Ti, other elements. Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

Bosch: Nonferrous alloys for varied applications. Robert Bosch A.G. Metallwerke, Stuttgart, Germany.

Bourne Fuller Acme: Medium-carbon steel for armature shafts, spindles, gears. Republic Steel Corp., Republic Bldg., Cleveland.

Bourne Fuller Special Alloy: Plain carbon steel for drive shafts, spindles. Republic Steel Corp., Republic Bldg., Cleveland.

Bowser-Kold-Hold: Industrial chilling units

for shrink-fit assembly, tool hardening and gage stabilization. Bowser-Inc., Terryville, Conn.

Boxite: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Boxmag: Magnetic equipment for handling iron or separating loose iron from liquids or solids. Electromagnets, Ltd., Bond St., Birmingham 19, England.

Boxpok: One-piece cast steel driving and trailer wheel centers for steam locomotives. General Steel Castings Corp., Eddystone, Pa.

Boyd-Wagner: Magnet steels with tungsten or chrome for magnets. Boyd-Wagner Co., 1440 W. Lake St., Chicago.

Brackentubes: Flexible metal tubing. American Metal Hose Co., Waterbury 88, Conn.

Brale: Penetrators for hardness testing. Wilson Mechanical Instrument Co., Inc., 385 Concord Ave., New York 54.

Brass Dip: For bright dipping brass and copper. Turco Products, Inc., Los Angeles 54.

Brassoid: Brass-coated zinc for fabricated parts. American Nickeloid Co., Peru, Ill.

Brass Oilite: Self-lubricating bearings and machine parts made from powdered metals. Chrysler Corp., Amplex Div., P. O. Box 2718, Detroit 31.

Brass Steel: Brass-coated steel for easy formability in fabricated parts. American Nickeloid Co., Peru, Ill.

Brass Tin: Brass-coated tin for fabricated parts. American Nickeloid Co., Peru, Ill.

Brastil: Corrosion resistant brass with 4 Si for bearing metals, general castings. Doehler Die Casting Div., Doehler-Jarvis Corp., Toledo, Ohio.

Brazo: Flux for bronze welding steel, cast iron and malleable iron, and for fusion welding brass, bronze, copper and copper alloys. Linde Air Products Co., 30 E. 42nd St., New York 17.

Brearly: Corrosion-resistant straight-chrome stainless irons for turbine blades, tubes, tanks, utensils and chemical plant equipment. Brown, Bayley's, Ltd., Sheffield, England.

Brick-Mix: Plastic refractory for use in industrial stokers. Chicago Fire Brick Co., 1467 Elston Ave., Chicago 22.

Brickseal: For penetrating the pores and joints of firebrick to form protective glaze coating. Brickseal Refractory Co., 1029 Clinton St., Hoboken, N. J.

Bright Alloy: A ternary electroplate of copper, tin and zinc. Bright, hard, wear-resistant and nonmagnetic. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Brightray: 80-20 Nichrome for electrical resistances. Henry Wiggin & Co., Ltd., Birmingham, England.

Brikset: Chrome base and silicon base firebrick. Chicago Fire Brick Co., 1467 Elston Ave., Chicago 22.

Brillum: Light alloy for pistons. Ayedeecee Metals Co., Ltd., Tydfil, S. Wales, England.

Brilybdenum: Heat-resistant Mo-steel for piston rings. British Piston Ring Co., Coventry, England.

Brimsto: Acid-proof cements. Electro-Chemical Supply & Engineering Co., Wedge Bldg., Paoli, Pa.

Broachrite: Steel for machinery parts, gears, shafts. La Salle Steel Co., 919 N. Michigan Ave., Chicago.

Bronzalun: Bronze with abrasive grains cast in 85 Cu metal, for floor plates, car steps. American Abrasive Metals Co., Irvington, N. J.

Bronzark: Welding electrode for cast iron or copper. Westinghouse Electric Corp., East Pittsburgh.

Bronze Oilite: Self-lubricating bearings and machine parts made from powdered metals. Chrysler Corp., Amplex Div., P. O. Box 2718, Detroit 31.

Bronze-On-Steel: Powdered bearing bronze bonded to steel grip. Johnson Bronze Co., 505 S. Mill St., New Castle, Pa.

Bronze (Special): 88.5 Cu, 1 Ni, 0.2 P, 9.8 Zn, 0.5 Te; age-hardenable, high-strength, free-machining, readily forged alloy; high corrosion resistance. Chase Brass & Copper Co., Waterbury, Conn.

Bronzend: Bronze welding electrode. Arcos Corp., 1515 Locust St., Philadelphia.

Bronzochrom: Welding rods and fluxes used for building up new or worn surfaces subject to frictional wear. Eutectic Welding Alloys Corp., 40 Worth St., New York 13.

Brown-Bayleys: Corrosion-resistant Cr and Cr-Ni stainless steels for valves, chemical plant equipment. Brown, Bayley's Ltd., Sheffield, England.

Bru-Kool: Grinding coolants. Bruce Products Corp., 5712 12th St., Detroit 8.

Bruce: Drawing, grinding and buffing compounds; spray booth coatings. Bruce Products Corp., 5712 12th St., Detroit 8.

Bruko: Drawing compounds. Bruce Products Corp., 5712 12th St., Detroit 8.

Bruning: Engineering and drafting supplies. Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41.

Brushing Nuglu: Nuglu (liquid cold glue) and aluminum-oxide grit combined into one mixture for recoating polishing wheels by brushing on one coat of this material. J. J. Siefen Co., 5657 Lauderdale Ave., Detroit.

Brymill: Series of plain carbon steels for case-hardened parts, deep pressings, general engineering applications. British Rolling Mills, Ltd., Tipton, Staffs., England.

BTU: Furnace blocks. Drake Non-Clinkering Furnace Block Co., Inc., Weatherly, Pa.

Buckeye: Rigid steel conduit and high-carbon steel wire. Youngstown Sheet & Tube Co., Youngstown.

Buckeye: Low heat duty fireclay brick. North American Refractories Co., 1012 National City Bank Bldg., Cleveland 14.

Buckingham: Abrasive compound for producing a high finish on stainless steel articles. Buckingham Products Co., 8900 Hubbell Ave., Detroit 27.

Buffalo: Elevator buckets. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Buflokast: Gray iron and chemical castings. Blaw-Knox Co., Buflovak Equipment Div., 1591 Fillmore Ave., Buffalo.

Buflovak: Chemical plant equipment. Blaw-Knox Co., Buflovak Equipment Div., 1591 Fillmore Ave., Buffalo 11.

Buehler: Cut-off machines, metallurgical specimen mounting presses, grinders, polishing machines. Buehler, Ltd., 165 W. Wacker Drive, Chicago 1.

Buffing Nu-Spra-Glu: Liquid form of bar compositions, used for producing mirror finish on all metals; is sprayed directly onto the revolving buffing wheel. J. J. Siefen Co., 5657 Lauderdale Ave., Detroit.

Buflokast: Special cast iron for chromium plating; drums, dryers, and other chemical and engineering equipment. Buffalo Foundry & Machine Co., 41 Winchester Ave., Buffalo.

Bulk-Flo: Elevator - conveyor - feeders. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Bull: Alloy of 76 Pb, 17 Sb, 7 Sn for bearings. Ajax Metal Co., 52 Richmond St., Philadelphia 23.

Bull Dog: Electrical controlling and distributing apparatus. Bull Dog Electric Apparatus Co., Detroit 32.

Bullard-Dunn Descaling: Electrochemical process for descaling and simultaneously depositing a protective metal coating. Bullard Co., Bridgeport 2, Conn.

Bullneck: Heavy-duty, push-type grease fittings. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis.

Bullshead: Oak tannage leather belt; cup or U packings. Chas. A. Schieren Co., 30-38 Ferry St., New York 7.

Bulls Head W. M.: Barbed wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Bull's Metal: Corrosion-resistant brass with Fe-Sn, for marine hardware, propellers. Bull's Metal & Melloid Co., Ltd., Glasgow, Scotland.

Bunatol: Electroplating rack insulation. Nelson J. Quinn Co., Toledo 7.

Bundyweld: Steel and copper composite tubing for gasoline and oil lines, refrigerator coils. Bundy Tubing Co., Hern at Springfield Ave., Detroit.

Bunker Hill: Electrolytic-purified 99.99 pct zinc. St. Joseph Lead Co., 250 Park Ave., New York 17.

Bunting: Bearings and bushings. Bunting Brass & Bronze Co., 717 Spencer St., Toledo.

Bura-Way: Tool grinding machines. Norton Co., Worcester 6.

Burden: Two types of wrought iron for plates, pipes. Burden Iron Co., Troy, N. Y.

Burdett: Infrared gas burning ovens for drying operations. Burdett Mfg. Co., 37 N. Loomis St., Chicago 7.

Burndy: Series of highly alloyed bronzes for castings. Burndy Engineering, Inc., 107-T Bruckner Blvd., New York.

Burro: Locomotive cranes, clamshell buckets, rail tongs. Cullen-Friestedt Co., 1300 S. Kilbourn Ave., Chicago 23.

Burroff: Tool to deburr and chamfer drilled holes through yoke-shaped parts. South Shore Machine & Tool Works, Inc., Seaford, L. I., N. Y.

Bush Brand: Fatigue and wear-resistant phosphor bronze for bearings. Thos. Bolton & Sons, Widnes, England.

Butt Brass: Brass with 35 Zn, 1 Pb; for pipes, tubes, hardware. American Brass Co., Waterbury, Conn.

Button Head: Grease fittings with smooth face, one piece head for heavy industrial machinery. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis.

Buxite: Grinding wheels. Bridgeport Safety Emery Wheel Co., Inc., 1301 W. Broad St., Stratford, Conn.

Buzzer: Gas-fired hardening, muffle, soft-metal, bench and soldering furnaces; pipe, nozzle and ring burners. Charles A. Hones, Inc., Baldwin, N. Y.

—C—

C & D: Hot tops for steel ingots; full-floating, adjustable, renewable and reusable. Ferro Engineering Co., Hanna Bldg., Cleveland 15.

Cable King: Electric hoists. Yale & Towne Mfg. Co., 4532 Tacony St., Philadelphia 24.

Cadux Anodes: Cadmium anodes especially suited for bright plating. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Calduro: 13 Cr, 2 Ni corrosion and abrasion-resistant steel. Warman Steel Casting Co., 6100 S. Boyle Ave., Huntington Park, Calif.

Calite: High-chrome iron alloys, also with Ni, to resist heat and corrosion in furnace parts. Calorizing Co., 400 Hill Ave., Pittsburgh.

Calliflex: Tungsten alloy for thermostats. Callite Tungsten Corp., Union City, N. J.

Callinite: High-conductivity tungsten alloy used for hardfacing. Callite Tungsten Corp., Union City, N. J.

Calloy: Series of lead-barium, calcium, strontium alloys for bearings. Calloy, Ltd., Avonmouth, England.

Calmar: 18-8 stainless for corrosion-resistant applications. Warman Steel Casting Co., 6100 S. Boyle Ave., Huntington Park, Calif.

Calmar 18-8 Cb: Abrasion resistant stainless steel for castings. Warman Steel Casting Co., 6100 S. Boyle Ave., Huntington Park, Calif.

Calmolloy: Tungsten alloy for grid wire. Callite Tungsten Corp., Union City, N.J.

Calorized Steel: Steel coated with aluminum, for machine parts, tubes, pots, refinery applications. Calorizing Co., 400 Hill Ave., Pittsburgh.

Caloxo: Series of highly alloyed nickel-chrome steels for heavy anticorrosion service. Warman Steel Casting Co., 6100 S. Boyle Ave., Huntington Park, Calif.

Calrod: Electric units for numerous heating and melting applications. General Electric Co., Schenectady.

Calsun Bronze: Corrosion-resistant bronze with 2.5 Al for electrical conductors. American Brass Co., Waterbury, Conn.

Cambriloy: Plain-carbon steel for mesh belts. Cambridge Wire Cloth Co., Cambridge, Md.

Camloy: High nickel-chrome-iron alloy (about 50 Fe) for marine parts, valves, turbine blades. L. Cameron & Son, Sheffield, England.

Cannonite: Low-carbon cast iron for diesel engines and refrigerator parts, crankshafts, pistons, cylinders. Campbell, Wyant & Cannon Foundry Co., Shenry St., Muskegon, Mich.

Canzler: Series of brasses, bronzes and coppers used as welding wire. Perry Equipment & Supply Co., 1515 W. Thompson St., Philadelphia.

Carbalox: Aluminum-oxide abrasive. Clover Mfg. Co., Norwalk, Conn.

Carbex: Silicon-carbide, super-refractory. McLeod & Henry Co., Inc., 359 First St., Troy, N.Y.

Carbicon: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Carbonia: Gun-metal finish. American Gas Furnace Co., Elizabeth, N.J.

Carbonite: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Carbonite: Silicon-carbide abrasive. General Abrasive Co., Niagara Falls, N. Y.

Carborix: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Carborundum: Silicon-carbide abrasive. Clover Mfg. Co., Norwalk, Conn.

Carbucouple: Thermocouples. Brown Instrument Co., 4498 Wayne Ave., Philadelphia 44.

Carilloy: All types of alloy steels. Carnegie-Illinois Steel Corp., Pittsburgh.

Carnolia: Antifriction alloy for bearings. Chas. Carr, Ltd., Smethwick, Birmingham, England.

Carobronze: Corrosion-resistant 0.3 phosphor bronze for solid cold drawn tubes, bushes. Carobronze, Ltd., London, England.

Cascade: Oxygen and nitrogen. Linde Air Products Co., 30 E. 42nd St., New York 17.

Castaloy: Nonferrous white alloy for chemical apparatus. Fisher Scientific Co., Farber St., Pittsburgh.

Castolin: Series of welding rods and brazing alloys. Eutectic Welding Alloys, Inc., 40 Worth St., New York.

CCC: Electrical equipment and controllers. Clark Controller Co., Cleveland, 10.

CE-C: Gray paint with resistance to weather and stack fumes; will not peel if heated to 1200°; for hot stacks, oil stills, cement kilns smelters furnaces, gas generators and retorts; applied with brush. Cheesman-Elliot Co., Inc., 645 Kent Ave., Brooklyn.

Cecolloy: Series of synthetic iron alloys for anvils, forged frames, dies, liners. Chambersburg Engineering Co., Chambersburg, Pa.

Cenco: Scientific instruments, laboratory apparatus and supplies. Central Scientific Co., 1700 Irving Park Rd., Chicago 13.

Celanese: Synthetic yarns for electrical insulation; fabric tapes for electrical insulation; lint-free fabrics for polishing cloths, uniforms, gloves and hats. Celanese Plastics Corp., 180 Madison Ave., New York 16,

Cerromatrix: Bismuth-tin-lead-antimony alloy for dental applications. Cerro de Pasco Copper Co., 40 Wall St., New York.

C-F: Welding positioners, sheet lifters, car pullers. Cullen-Friestedt Co., 1300 S. Kilbourn Ave., Chicago 23.

C-H or Cutler-Hammer: Electric motor control, safety switches, magnetic brakes, magnetic clutches, magnetic separators, valve control, electric heating devices, gas measuring and mixing devices, etc. Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1.

Chace Bimetal: Bimetal for thermostats. W. M. Chace Valve Co., 1616 Beard Ave., Detroit 9.

CMSZ Alloy: Combination of chromium, manganese, silicon and zirconium used as a ladle addition for making high-strength cast iron having good machinability. Electro Metallurgical Co., 30 E. 42nd St., New York 17.

CSM: Knee-type milling machines. Kearney & Trecker Corp., Milwaukee 14.

C.S.R.: Steel wire. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

CVAC No. 1 Treatment: Anodic oxidation of magnesium alloys by sodium hydroxide electrolyte followed by chromate sealing. American Magnesium Corp., 2224 Harvard Ave., Cleveland.

CW Pipe: Seamless and welded steel pipes. Spang-Chalfant Div., Grant Bldg., Pittsburgh 30.

Cactus: Barbed wire. Bethlehem Steel Co., Bethlehem.

Cadalyte Anti-Pit Agent: Mixture for Cadalyte cadmium plating salts to prevent pitting in cadmium-plated deposits. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Cadalyte Bright Dip: Concentrated, clear liquid which is diluted with 15 parts water for use, to produce brighter cadmium deposits by bright dipping; to add tarnish-resisting film on surface of cadmium-plated products. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Cadalyte Brightener: Special mixture added to cadmium or Cadalyte cadmium-plating baths to produce bright deposits. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Cadalyte Cadmium Plating Salts: Yellowish-brown to white, coarse powder consisting of a mixture of sodium cyanide, cadmium oxide and brighteners, which deposits cadmium in a very bright, ductile and adherent form. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Cadalyte Maintenance Compound: Prepared mixture for maintaining correct ratio of cyanide and brightener content of cadmium or Cadalyte cadmium-plating baths. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Cadmium Fluoborate: A high-speed acid cadmium electroplating solution. General Chemical Co., 40 Rector St., New York 6.

Cadux: Cadmium plating process. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Calal: See Calloy.

Caldwell: Helicoid conveyor and sectional flight screw conveyors. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Calido: Series of nickel-chrome iron alloys for dipping baskets and electrical resistance materials. Driver-Harris Co., Harrison, N. J.; Electro-Alloys Div., 1938 Taylor St., Elyria, Ohio.

Calite A: High-carbon chrome-nickel stainless alloy for carburizing boxes, hearth plates, retorts. Calorizing Co., Wilkinsburg Station, Pittsburgh 22.

Calite: Series of chromium-nickel heat enduring and corrosion-resisting alloys available in cast, rolled and forged products. Calorizing Co., Wilkinsburg Station, Pittsburgh 21.

Calmaloy: Copper-bearing nickel alloy used in devices to compensate for thermal changes. General Electric Co., Schenectady.

Calobar Lenses: Absorptive lenses for protection against ultra-violet and infra-red radiations. Scientifically treated to resist impact. American Optical Co., Southbridge, Mass.

Calol: Various types of cutting fluids, concentrates, soluble oils and quenching oils. Standard Oil Co. of California, Standard Oil Bldg., San Francisco 20.

Calomic: 65-Ni, 15 Cr, 20 Fe alloy for electrical resistances. Telegraph Construction & Maintenance Co., Ltd., London, England.

Caloria: High-temperature lubricant; gradually vaporizes when used, and leaves no residue; used for high-temperature lubrication. Stanco, Inc., 28 Broadway, New York 14.

Calorite: Series of nickel-chrome iron alloys for resistance wire in electrical heating apparatus. General Electric Co., Schenectady, N. Y.

Calorizing: Process for impregnating the surface of carbon or low-alloy steels to create an iron-aluminum alloy resistant to high-temperature oxidation and corrosion due to gaseous sulphur compounds encountered in flue gases. Calorizing Co., Wilkinsburg Station, Pittsburgh 21.

Calwico: Woven wire cloth, fencing, conveyor belts, wire, etc. California Wire Cloth Corp., Denver, Colo.

Cambria Perfect (and Special): Barbed wire. Bethlehem Steel Co., Bethlehem.

Cameo: Calcium carbide. Linde Air Products Co., 30 E. 42nd St., New York 17.

Cam-O-Lap: Camshaft lapping machines. Norton Co., Worcester 6.

Cam-O-Matic: Automatic camshaft grinding machines. Norton Co., Worcester 6.

Campbell: Various types of chains. International Chain & Mfg. Co., York, Pa.

Cam-Stat: Small compact thermostat. Cam-Stat, Inc., 2037 S. La Cienega, Los Angeles.

Canton: Alligator shears for processing ferrous and nonferrous scrap. Also portable cranes, light-weight welded steel design with self-locking worm mechanism; 1 to 3-ton capacity. Hill Acme Co., 6400 Breakwater Ave., Cleveland 2.

Capacitrols: Electronic indicating pyrometer controllers for the indication and control of temperature, voltage, current, speed and similar variables. Wheelco Instruments Co., Chicago 7.

Capitol: Nickel salts. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Capstone: Nickel-plating salts. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Carbalt: Plastic troweling material for chemical resistant tank linings and coatings, also leak repairs. Heil Engineering Co., 12901 Elmwood Ave., Cleveland 11.

Carbanalyzer: Magnetic instrument for determining carbon content of steel samples. Fisher Scientific Co., Forbes St., Pittsburgh.

Carbanalyzer: Instrument for quick carbon determinations in steel. Fisher Scientific Co., 712 Forbes St., Pittsburgh.

Carbic: Portable acetylene floodlights; portable acetylene generators; and calcium carbide processed in briquetted form. Linde Air Products Co., 30 E. 42nd St., New York 17.

Carbo: Carburizing compound for carburizing or case-hardening steel machine parts. Rodman Chemical Co., Verona, Pa.

Carbon Mo: Low-alloy steels with Mo, for oil industry applications and steam piping. National Tube Co., Frick Bldg., Pittsburgh.

Carbofrax: Silicon-carbide super refractories for melting and heat treatment of both ferrous and nonferrous metals. Carborundum Co., Refractories Div., Perth Amboy, N. J.

Carbolite: Artificial abrasive produced in electric furnaces from coke, sand, sawdust and salt. American Emery Wheel Works, Richmond Square, Providence, R. I.

Carbolite: Calcium carbide. Linde Air Products Co., 30 E. 42nd St., New York 17.

Carboloy: Series of hard-metal compositions employed not only for metalworking purposes, but also as a wear-resistant metal for use on machine parts and other product parts. Carboloy Co. Inc., Box 237, Roosevelt Park, P. O., Detroit 32.

Carbometer: Swedish magnetic instrument for making carbon determinations in steel R. D. Bates, 921 Bergen Ave., Jersey City, N. J.

Carbon Basolit: Sulphur-carbon compound, used with carbon brick for construction of hydrofluoric pickling tanks and for acid-proof floor construction. Nukem Products Corp., 122 Colgate Ave., Buffalo 20.

Carbon Moly 0.50: Arcwelding electrode for steel; corresponds to AWS E7020. Metal & Thermit Corp., 120 Broadway, New York 5.

Carbonia Finish: Deep, black, lustrous gunmetal finish applicable to all ferrous metal parts by a combination of heating, oxidizing, and carbon impregnating; does not flake off and highly rust resistant. American Gas Furnace Co., Elizabeth, N. J.

Carbonite: Silicon-carbide abrasive grains for polishing, lapping, grinding, etc. General Abrasive Co., Niagara Falls, N. Y.

Carbora: Silicon carbide grinding wheels for cast iron and materials having low tensile strength. Cortland Grinding Wheels Corp., Chester, Mass.

Carbrax: Carbon remover for engines. Turco Products, Inc., Los Angeles 54.

Card Flat: Chains. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Cardox: Fire extinguishing systems using low temperature, low pressure carbon dioxide in storage capacities of 500 lb to 125 tons. Cardox Corp., 307 N. Michigan Ave., Chicago 1.

Cargocrane: Wheel-mounted cranes. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Carilloy: Alloy steels for all types. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 20.

Carilloy Steels: Wide range of constructional alloy steels produced to specification requirements of the automotive, aviation, bearing, and similar industries. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30.

Cariron: Iron with T.C., Mn, Si, Ni; for liners and pistons. Fillmore Foundry Inc., 153 Fillmore Ave., Buffalo.

Carloader: Industrial fork truck for lifting, carrying and tiering 2-ton loads. Clark Tructractor, Div. of Clark Equipment Co., Battle Creek, Mich.

Carmet: Blanks, tools and die sections of sintered tungsten and other carbides. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh.

Carobronze: Contains 91.2 Cu; 8.5 Sn; 0.3 P; can carry heavy loads at high speeds; available in tubes, wire, rods, bars, sheet and strip. Wrought Bearings Metals, Inc., 76 E. 45 St., New York.

Caro-Line: Monolithic refractory linings for acid electric furnaces, ladles, side-blow converters. Ironton Fire Brick Co., Ironton, Ohio.

Carpenter: All types of stainless steel; and low-chromium grades of the stainless type; magnet steels. Invar minimum-expansion alloys; special alloys for glass-to-metal seals; valve and valve-seat alloys; full line of case-hardening alloy steels. Carpenter Steel Co., Reading, Pa.

Carronizing: Method of plating nickel and zinc or nickel and tin onto steel and then fusing by heat. For corrosion protection and as paint base. Standard Steel Spring Co., Coraopolis, Pa.

Cascade: Liquid oxygen and nitrogen, delivered in tank-truck lots, converted on delivery, and stored by the customer as high-pressure dry gas until needed. Linde Air Products Co., 30 E. 42nd St., New York 17.

Cast-All: Dental gold. A. Robinson & Son, 131 Canal St., New York 2.

Casteel: Carbon and alloy electric furnace steel castings. Calumet Steel Castings Corp., 1636 Summer St., Hammond, Ind.

Cas-To-Fit: Castable refractory. Robinson Clay Products Co., Akron 9, Ohio.

Castolin: Low-temperature welding alloys and fluxes for joining of metals. Eutectic Welding Alloys Corp., 46 Worth St., New York 13.

Cast-Refract: Refractory which can be cast or molded into any desired form; sets quickly with great structural strength. Quigley Co., Inc., 527 Fifth Ave., New York 17.

Castolin Eutectic Welding: Series of eutectic welding alloys which melt and fuse with base metal, which is heated but not molten, the bond being accomplished by capillary action; for brazing steel, malleable cast iron, tungsten carbide, aluminum, copper, etc. Eutectic Welding Alloys, Inc., 46 Worth St., New York 13.

Castolin No. 16C: Copper-base alloy and flux with low melting point and high strength; for rapid brazing of steel with high frequency current or in furnaces. Eutectic Welding Alloys Co., 46 Worth St., New York 13.

Catabond: Liquid phenolic bonding resin. Catalin Corporation of America, 3 Park Ave., New York.

Catalin: Cast phenolic resin. Catalin Corporation of America, 3 Park Ave., New York.

Cataract Metal: Cu-Ni composition for machine parts, chemical apparatus, valves on superheated steam lines. Niagara Falls Smelting & Refining Corp., Jarvis & Elmwood Aves., Buffalo.

Catavar: Liquid phenolic laminating resin. Catalin Corp. of America, 3 Park Ave., New York.

Causplit: Cold-setting resin cement for acid-proof tile or brick. Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7.

Causul Metal: 15 Ni, Cu-Cr austenitic cast iron for corrosion-resistant valve bodies, paper mill and other corrosion service. Lunkenheimer Co., Beekman St. & Waverly Ave., Cincinnati.

Cecolloy: Cast iron with Mn-Si-Ni-Mo, for steam cylinder liners, valves. Chambersburg Engineering Co., Chambersburg, Pa.

Cecostamp: Drop hammer. Chambersburg Engineering Co., Chambersburg, Pa.

Ceil-Por: Coated onto any bonderizing or processing tank to increase life. Ceilcote Co., 750 Rockefeller Bldg., Cleveland.

Ceilcote: Acid-proof lining for pickling tanks, pits, drains, floors, basins, foundations. Ceilcote Co., 750 Rockefeller Bldg., Cleveland.

Celcon: Ethyl-cellulose molding plastics, formerly Lumarith EC. Celanese Plastics Corp., 180 Madison Ave., New York.

Celectray: See Tag. C. J. Tagliabue Div., 595 Park Ave., Brooklyn 5.

Celite: Filtering material (diatomaceous silica) for clarifying, cutting, grinding, washing and cooling oils and emulsions. Johns-Manville Sales Corp., 24 E. 40th St New York 16.

Celto: Weldin electrode. Keasby & Matteson Co., Ambler, Pa.

Cenco: Copper for bearings. Central Brass & Aluminum Foundry Co., Cincinnati.

Cenco: Scientific instruments, laboratory apparatus and supplies. Central Scientific Co., 1700 Irving Park Rd., Chicago 13.

Cenco-Derge: Self-contained apparatus for measuring oxygen in steel samples in 10 min. Central Scientific Co., Chicago 13.

Cenco-Hangosky Electropolisher: Self-contained unit for electropolishing ferrous and nonferrous specimens for microscopic examination. Central Scientific Co., Chicago 13.

Cenlaco: Rig steel conduit. Spang-Chalfant Div., Grant Bldg., Pittsburgh 30.

Center Drive: Method of cylindrical grinding or turning in a lathe wherein the work is driven by a rotating center in place of a dog. J. R. Fish Research & Engineering Co., 1341 Main St., Agawam, Mass.

Centerless: Precision grinding and precision lapping machines by the centerless method. Cincinnati Grinders, Inc., Marburg Ave., Cincinnati.

Central Black: Rigid steel conduit. Spang-Chalfant Div., Grant Bldg., Pittsburgh 30.

Central Pure Iron: Complex iron alloy for culverts. Republic Steel Corp., Republic Bldg., Cleveland.

Centralloy: Centrifugal permanent-mold sleeve castings of electric furnace alloys. Centrifugal Casting Co., Muskegon, Mich.

Centralloy: Steel alloy for bus and railway bodies. Central Iron & Steel Co., Harrisburg, Pa.

Centrard: Nitrogen hardened Cr-Al alloy cast iron for cylinder liners and abrasion resistance. Sheepbridge Stokes Centrifugal Castings Co., Ltd., Chesterfield, England.

Centri-Meco: Centrifugal casting machines of all types and sizes; stock and custom built equipment, both vertical and horizontal styles. Also precision casting equipment. Centrifugal Machine & Engineering Co., 633 Jackson Court, Kalamazoo 7, Mich.

Centrificast: Leaded, dense-grained bushing bronze centrifugally cast. United American Metals Corp., 200 Diamond St., Brooklyn 22.

Centrimax: Flowmeters. Leeds & Northrup Co., 4945 Stenton Ave., Philadelphia.

Centri-Swirl: Dust and fume control equipment. Schmieg Industries, 310 Piquette Ave., Detroit.

Centro-Matic: Centralized lubricating system with each bearing supplied with lubricant from a central pump. Lincoln Engineering Co., 5701 Natural Bridge Ave., St. Louis.

Century: All types of electrical motors and generators. Century Electric Co., 1806 Pine St., St. Louis.

Ceralumin: Aluminum alloy with Si-Cu-Mg-Fe-Ni-Ce for light-alloy parts. J. Stone & Co., Deptford, London, England.

Certain Curtain: Heat-treating furnaces. C. I. Hayes, Inc., 77 Baker St., Providence.

Ceri-Seal: Acid and alkaline-resistant floor sealer and wax. Turco Products, Inc., Los Angeles 54.

Cerrobase: Bismuth, lead eutectic alloy; melts at 255° F; used as matrix in electroforming molds, dies, etc.; for duplicate patterns and as filler in bending heavy tubing. Cerro de Pasco Copper Corp., 40 Wall St., New York 5.

Cerrobend: Bismuth, lead, tin, cadmium eutectic alloy; melts at 158° F; used as filler for bending thin-walled tubing, removed easily in boiling water. Cerro De Pasco Copper Corp., 40 Wall St., New York 5.

Cerrolow-117: Bismuth lead, tin, cadmium, indium eutectic alloys; for safety devices in refrigeration, sprinkler heads, fire door releases, etc. Cerro De Pasco Copper Corp., 40 Wall St,, New York 5,

Cerromatrix: Bismuth, lead, tin, antimony alloy; melting range 217° to 440° F; for securing punch and die parts, anchoring machine parts and for short run forming dies. Cerro De Pasco Copper Co., 40 Wall St., New York 5.

Cerrosafe: Bismuth, lead, tin, cadmium alloy; melting range 165° to 190° F; for accurate proof casting mold and forging die cavities and for metallizing wood patterns and core boxes. Cerro De Pasco Copper Corp., 40 Wall St., New York 5.

Cerrotru: Bismuth, tin eutectic alloy. Melts at 281° F. Non-shrinking alloy for soft metal molds in "lost-wax" process, models for Keller and Gorton machines. Cerro De Pasco Copper Corp., 40 Wall St., New York 5.

Certain Curtain: Atmosphere-controlled electric furnaces for heat treating metals. C. I. Hayes Co., Providence, 5, R. I.

Cetal: 6.5 Si, 3 Cu, 10 Zn aluminum alloy for general use. Metallgesellschaft, A.G., Frankfurt O/M, Germany.

Cetec: Coal molded compounds. General Electric Co., Schenectady.

Chace: Thermostatic bimetal. W. M. Chace Co., 1600 Beard St., Detroit.

Chamet: High-strength, corrosion-resistant bronze alloy, intended primarily for shafting and structural uses; also for cold-heading purposes. Chase Brass & Copper Co., Inc., Waterbury 91, Conn.

Chamet Bronze: Tin-bearing 60-40 brass resisting sea water, for welding rods, bolts, screws. Chase Brass & Copper Co., Inc., Waterbury, Conn.

Champion: Sewed-pieced buff. F. L. & J. C. Codman Co., Rockland, Mass.

Champion: Two types of ferrous welding rods. Champion Rivet Co., Harvard & E. 108th St., Cleveland.

Champion: Wire-cut ladle, runner and hot-top brick. McLain Fire Brick Co., Gulf Bldg., Pittsburgh.

Champion Holder: Rapid interchangeable marking with steel characters. Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh 13.

Chapmanizing: Method of imparting a carbon-nitrogen case to low-carbon steels; also giving extreme wear resistance. Chapman Valve Mfg. Co., Indian Orchard, Mass.

Char: Carburizing compound for case-hardening steel made from sized coal tar carbon and charcoal; special carbon which produces at annealing temperatures the correct atmosphere for box annealing that is neither carburizing or decarburizing; special carbon for covering baths of molten lead, zinc, galvanizing metal, etc. Reilly Tar & Chemical Corp., Merchants Bank Bldg., Indianapolis 4.

Char-Mo Gas: Carbon-rich atmosphere for carburizing, bright annealing and hardening carbon and alloy steels. Surface Combustion Corp., Toledo 1.

Chase: Brass, copper, bronze and nickel silver strip, sheet, bar, plate, rod, wire, tube and fittings, pipe, shapes, nuts, bolts, welding rod and wire-cable, magnet wire. Chase Brass & Copper Co., Inc., Waterbury 91, Conn.

Chase Tellurium Copper: High conductivity and heat treatable copper alloys for general use. Chase Brass & Copper Co., Inc., Waterbury, Conn.

Chateaugay: Low-phosphorus pig iron for casting rolls, gears, cylinders, steel and iron. Republic Steel Corp., Standish, N. Y.

Chekmatic: Gaging instrument employing automatic means of multiple inspection. Sheffield Corp., Box 893, Dayton 1.

Chemox: Oxygen-supplied mask enabling

wearer full freedom of operation and supplying him with pure oxygen for a period of 1 hr. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

Chemstone Asbestos: Cement sheets. Johns-Manville, 24 E. 40th St., New York 16.

Cherry: Blind rivets. Cherry Co., 233 Winston St., Los Angeles 13.

Cherry Rivets: Rivets that are installed with a controlled pulling action by one operator. Requires access to one side of application only. Cherry Rivet Co., 231 Winston St., Los Angeles 13.

Chicago Wide Band Air Diffusion System: Swing diffusers for sewage and industrial waste treatment plants. Chicago Pump Co., 2300 Wolfram St., Chicago 18.

Chief Sandusky: Centrifugal bronze castings from 3 to 46 in. in diam and up to 347 in. long. Sandusky Foundry & Machine Co., Sandusky, Ohio.

Chillo Oils: For cutting, broaching, threading and other machining operations; mineral-lard blends, sulphur-saponifiable and sulphur-chlorine saponifiable. Cities Service Oil Co., Bartlesville, Okla.

Chillo Oils: Metal cutting fluids. Cities Service Oil Co., 70 Pine St., New York 5.

Chitonal: Coated aluminum alloy for light-alloy parts in marine applications. Lavorazione Leghe Leggere, Milano, Italy.

Chlorextol: Non-inflammable transformer insulating liquid. Allis-Chalmers Mfg. Co., Milwaukee 1.

Chlorimet No. 2: A 60 Ni, 30 Mo alloy. Recommended for hydrochloric acid service. Duriron Co., Inc., Dayton 1.

Chlorimet No. 3: 60 Ni, 17 Mo, 17 Cr alloy, recommended for hydrochloric acid and unusual sulfuric acid service under oxidizing conditions and for moist chlorine gas. Duriron Co., Inc., Dayton 1.

Chrom-X: Exothermic ferrochromium for electric furnace and open hearth additions. Chromium Mining & Smelting Corp., Ltd., Sault Ste. Marie, Ontario, Canada.

Chrom Zinc: Chromium-plated sheet zinc. Apollo Metal Works Co., Clearing Station, Chicago 38.

Chromador Steel: A high tensile Mn-Cr-Cu alloy steel to resist corrosion in structural applications, tanks, rivets. Isteg Steel Products Co., Westminster, England.

Chromadur: 0.15, 18 Mn, 12.5 Cr, 1.0 V and and 0.25 Ni high-temperature alloy for gas turbines. Friedrich Krupp, A.G., Essen, Germany.

Chromaloid: Zinc with a chrome coating for plumbing fixtures, hardware. American Nickeloid Co., Peru, Ill.

Chromalloy: Soldering flux for black iron. Colonial Alloys Co., Ridge Ave. & Crawford, Philadelphia.

Chromaloy: Heat-resistant 80-20 Ni-Cr alloy for electrical resistances and high-temperature service. A. C. Scott & Co., Ltd., Manchester, England.

Chroman: Series of iron-nickel-chrome-manganese alloys for acid-resistant and heating elements. Heraeus-Vacuumschmelze A.G., Hanau, Germany.

Chromanal: Special grades of manganese steel. American Manganese Steel Div., Chicago Heights, Ill.

Chromang: Arcwelding electrode for armor plate. Arcos Corp., 1515 Locust St., Philadelphia 2.

Chromansil: Series of low-alloy steels with Cr-Mn-Si for boilers, ship plates, tubing, gears. Electro-Metallurgical Co., 30 E. 42nd St., New York.

Chromatizing: Treatment imparting thin, inert aluminum-oxide film to aluminum and aluminum alloys. Aluminum Co. of America, Pittsburgh; Reynolds Metals Co., Louisville.

Chromax: Two types of Cr-Ni irons for furnace parts, carburizing boxes, crusher rolls, chain parts. Driver-Harris Co., Harrison, N. J.

Chrome Magnet: Permanent magnet steel. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh.

Chromel: Series of Ni-Cr alloys for heating elements, electric furnaces and thermocouples. Hoskins Mfg. Co., Lawton & Kinnison Aves., Detroit 8.

Chromel: Alloys of nickel and chromium, used for electric heating elements and resistors. Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8.

Chromel-Alumel: Base metal thermocouple alloy combination. Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8.

Chromend: Series of arcwelding electrodes for stainless steel. Arcos Corp., 1515 Locust St., Philadelphia 2.

Chromend: Series of stainless steels used as welding rods for stainless and low Cr steels. Arcos Corp., 1515 Locust St., Philadelphia.

Chromeweld: Cr-Mo steel used as arcwelding electrode for welding 4-6 chrome steel. Lincoln Electric Co., 12818 Coit Rd., Cleveland 1.

Chromidium: Cast iron with C-Si-Cr-Mn for automotive cylinders, brake drums, liners. Midland Motor Cylinder Co., Birmingham, England.

Chromium Fluoborate: A high-speed acid chromium electroplating solution. General Chemical Co., 40 Rector St., New York 6.

Chromix: Chemically neutral, air-setting, super-refractory for construction of monolithic hearths in all types of heating and forging furnaces. Quigley Co., Inc., 527 Fifth Ave., New York 17.

Chromnickel: Nickel alloyed with 20 Cr, 2 Mn; for heating resistances up to 2000° F. Vereinigte Deutsche Metallwerke, A.G., Altena, Germany.

Chronin: Cr-Ni alloys containing Cu, Fe, Mn, Al; for electrical resistances, thermocouples. Vereinigte Deutsche Nickelwerke, A.G., Schwerte, Germany.

Chronoflo: Instrument for metering and controlling flow, pressure, etc., of liquids. Builders-Providence, Inc., 9 Codding St., Providence, R. I.

Chronoflow: Telemeters. Builders-Providence, Inc., Div. of Builders Iron Foundry, 41 Codding St., Providence 1.

Chronolog: For controlling idle time. National Acme Co., 170 E. 131st St., Cleveland 8.

Chronotherm: Thermostats. Brown Instrument Co., 4498 Wayne Ave., Philadelphia 44.

Chuck-Matic: Single-spindle chucking machines. National Acme Co., 170 E. 131st St., Cleveland 8.

Cimet: 27-11 Cr-Ni stainless for pumps, screens, valves, furnace parts, mining machinery. Driver-Harris Co., Harrison, N. J.

Cincinnati: Full line of milling, profiling, centerless grinding and lapping machines. Cincinnati Milling Machine Co., Marburg Ave., Cincinnati.

Cindal: Series of aluminum alloys for sea water corrosion resistance, cylinder heads, exhaust manifolds and general applications. Cindal Metals, Ltd., Liverpool, England.

Cindal Alloy: Stainless aluminum alloy for marine service and use in food industries. Cindal Metals Ltd., Liverpool, England.

Circ-Air: Industrial heat-treating furnaces. Industrial Heating Equipment Co., 3570 Fremont Place, Detroit 7.

Circle: Chrome stainless steels for chemical apparatus, boiler tube hangers, heat and corrosion service. Lebanon Steel Foundry, Lebanon, Pa.

Circle L: Cr-Mo and Ni-Mo steels for carburized or nitrided parts; also oil refinery applications. Lebanon Steel Foundry, Lebanon, Pa.

Circometric: Circular chasers for use in die heads. Geometric Tool Co., New Haven 15, Conn.

Circuline: Sludge collectors for centerfeed round tanks. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Cirflex: Thermostatic bimetal. H. A. Wilson Co., 107 Chestnut St., Newark, N. J.

Cisco Compounds: For the lubrication of exposed gears and cables. Cities Service Oil Cos., 70 Pine St., New York 5.

CJB: Ball, roller and thrust bearings; ball and roller bearing pillow blocks. Ahlberg Bearing Co., 3025 W. 47th St., Chicago 32.

Clark: Bolts, nuts, screws and rivets. Clark Bros. Bolt Co., Milldale, Conn.

Clarus Metal: High-strength aluminum alloy for airplane parts. Gabriel & Co., A. B. Roe, Birmingham, England.

Clean Air Blower: Furnishes cool, clean-dust-free air to users of air-supplied respiratory masks. Braddock, Thomas & Meade Sts., Pittsburgh.

Cleanblast: Shot grit cleaning process for castings, forgings, etc. Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.

Clean-Water: Traveling intake screens. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Cle-Forge: High-speed steel drills. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14.

Cletaloy: Copper-tungsten or silver-tungsten alloy for use in projection, butt or resistance welding electrodes, where heavy pressure and high welding temperatures are encountered. Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland 5.

Cletung: Pure tungsten welding electrodes used in either heliarc or atomic hydrogen

welding processes. Cleveland Tungsten, Inc., 10200 Meech Ave., Cleveland 5.

Cleveland: Circular relief grinders and universal indexing heads. Grinders & Fixtures, Inc., 1255 W. 4th St., Cleveland 13.

Cleveland: Fabricating tools such as punches, shears, planers and bending rolls; also mechanical power presses in all types and sizes. Cleveland Punch & Shear Works Co., Cleveland 14.

Cleveland Crane: Heavy overhead traveling cranes of all-welded steel construction for handling loads up to 300 tons and with spans up to 120 ft. Cleveland Crane & Engineering Co., 1115 E. 283rd St., Wickliffe, Ohio.

Cleveland Tramrail: Overhead materials-handling equipment including hoists, cranes, transfer bridges and trackage for hoisting and conveying of materials of every description. Cleveland Tramrail Div., Cleveland Crane & Engineering Co., 1115 283rd St., Wickliffe, Ohio.

Clevite: Series of bronzes with steel backing for wrist pin and transmission bearings. Cleveland Graphite Bronze Co., 17000 St. Clair St., Cleveland.

Climax: Heat and corrosion-resistant 24 Ni, 73 Fe, 2.6 Mn steel for electrical parts. Driver-Harris Co., Harrison, N. J.

Clinton: Fixtures, tools and jigs; spur, helical and spiral level gears; ferrous and nonferrous castings. Clinton Machine Co., Clinton, Mich.

Clinton: Screen cloth, industrial wire cloth and wire lath. Wickwire Spencer Steel Div., 500 Fifth Ave., New York 18.

Clipper: Masonry power saws. Clipper Mfg. Co., 4037 Chouteau, St. Louis 10.

Clorafin: Chlorinated paraffin used to impart flame, water and mildew resistance; used in metal-drawing compounds. Hercules Powder Co., Wilmington, Del.

Clorodine: Inhibited muriatic acid. American Chemical Paint Co., Ambler, Pa.

Clover: Abrasive papers and cloths, grinding compounds, lapping compounds, grinding wheels, crocus cloth. Clover Mfg. Co., Norwalk, Conn.

Cloverleaf: Alloy for bearings, bushings. Williams, E. A., & Sons, 111 Plymouth Ave., Jersey City, N. J.

Coanaillium: Corrosion-resistant aluminum alloy for marine parts. R. W. Coan, Ltd., London, England.

Coast Metal: Fe-Cr-Ni-Mn-C hard-facing alloy. Haynes-Stellite Co., Kokomo, Ind.

Coast Metals: Series of hard-facing alloys for resistance to abrasion and impact, high temperature; for brick and clay machinery, shafting, cams, steel mill guides, valves, dies. Coast Metals, Inc., 1238 Camden Ave., S.W., Canton, Ohio.

Coast Metals Nos. X and 100 X: Iron-base, Cr, Ni and Mo hard-facing alloys for acetylene and arc application. High impact strength and good wear resistance. For hot-shear blades. Coast Metals, Inc., 1238 Camden Ave., S.W., Canton, Ohio.

Coast Metals Nos. 18 and 118: Iron-base, Cr, Ni, Mo and Co hard-facing alloys. For engine valves, seat rings, superheated steam valves, pump shafts and sleeves, hot-work dies and punches. Coast Metals, Inc., 1238 Camden Ave., S.W., Canton, Ohio.

Coating Metal: 95 Pb coated iron for roofing, pipes. National Lead Co., 111 Broadway, New York.

Coats: Hand and stationary tachometers, centrifugal and chronometric. Coats Machine Tool Co., 17 Tudor Lane, Scarsdale, N. Y.

Cobaflux: Complex iron alloy with 37 Co, 4 W, 5 Cr or 19 Co, 9 W, 4 Cr, for magnets, magnetos, scientific instruments. Bethlehem Steel Co., Bethlehem.

Cobaflux Magnet A: Steel with 5 Cr, 4 W, 37 Co for permanent magnets. Bethlehem Steel Co., Bethlehem.

Cobalt Fluoborate: A high-speed acid cobalt electroplating solution. General Chemical Co., 40 Rector St., New York 6.

Cobanic: 55-45 nickel-chrome vacuum tube filament wire. Wilbur B. Driver Co., Newark, N. J.

Coburn: Sliding doors, garage, warehouse, automatic fire and overhead doors, overhead conveying equipment. Wickwire Spencer Steel Div., 500 Fifth Ave., New York 18.

Cocoon: Plastic protective packaging for metal products and machine elements. R. M. Hollingshead Corp., Camden, N. J.

Codol: Liquid grinding compound. D. A. Stuart Oil Co., 2729 S. Troy St., Chicago 23.

Coe Bronze: 10.5 tin-bronze for gears. American Brass Co., Waterbury, Conn.

Coileaf: Railway trucks and side frames. National Malleable & Steel Castings Co., Cleveland 6.

Colalloy: Mn-Mg-Si bearing aluminum alloy for chemical and food handling equipment. Colonial Alloys Co., Ridge Ave. & Crawford St., Philadelphia.

Colaweld: Coating material applied by spray, brush or as powder and then heated by oven, torch or other means to produce a fusion bond for zinc, cadmium, tin, bismuth, lead and their alloys to ferrous and nonferrous metals. Colonial Alloys Co., East Somerset, P.R.R. & Trenton Ave., Philadelphia.

Coldset: Foundry core paste. Independent Foundry Supply Co., 2325 E. 38th St., Los Angeles 11.

Collalloy: Armorplate weighing 50 pct less than steel. Colonial Alloys Co., East Somerset, P.R.R. & Trenton Ave., Philadelphia.

Collet Steel: 0.95 C, 0.7 Mn steel for collets. Bethlehem Steel Co., Bethlehem.

Colmonoy: Series of Ni and Fe alloys for hard facing castings, welding rods. Colmonoy, Inc., Los Nietos, Cal.

Colmonoy Nos. 4, 5 and 6: Hard-surfacing alloys having hardness from 35 to 60 Rc. For forming and drawing dies, steam valves, bearing surfaces, etc. Wall-Colmonoy Corp., 722 Fisher Bldg., Detroit 2.

Colonial: Series of chrome alloy stainless steels for structural parts, chemical and paper machines, valves. Colonial Steel Div., Grant Bldg., Pittsburgh.

Colonial Degreasers: Cyclodiene hydrocarbon solvent degreaser for metal parts prior to plating, painting, rust-proofing, etc. Colonial Alloys Co., East Somerset, P.R.R. & Trenton Ave., Philadelphia.

Colonial Stainless: Series of stainless irons and steels for cutlery, valve parts, gears, dental instruments, machine parts. Colonial Steel Co., Monaca, Pa.

Colorbond: Galvanized sheet with paint-bonding surface. Newport Rolling Mill Co., Newport, Conn., and Wall-Colmonoy Corp., 722 Fisher Bldg., Detroit 2.

Colorless Waterproofing: Liquid waterproofing which is brushed on wall surfaces. Stonhard Co., 401 N. Broad St., Philadelphia 8.

Coloron: Method of coloring stainless steel; various colors, fairly abrasion resistant, fully corrosion resistant. Coloron Corp., National Savings Bank Bldg., Albany.

Colortop: Plug fuses, non-renewable. Trico Fuse Mfg. Co., 5th and Chambers St., Milwaukee 12.

Colorstrip: Cold-rolled strip steel with surface colors, for ornamental architecture. Acme Steel Co., Chicago.

Color-Stripe: Coated abrasive papers and cloths. Clover Mfg. Co., Norwalk, Conn.

Colmonoy: Acid-resistant hard-facing welding rods of special composition. Colmonoy, Inc., Los Nietos, Calif.

Columbian: All types of metal and wood vises. Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4.

Columbia Spring: 0.9 C steel for springs. Columbia Tool Steel Co., Chicago Heights, Ill.

Colville Stainless Iron: 17-Cr stainless iron for heat and corrosion resisting parts. Colvilles, Ltd., Glasgow, Scotland.

Comaco-Elasticometer: Springless coil-spring testing machines. Coats Machine Tool Co., Inc., 17 Tudor Lane, Scarsdale, N. Y.

Combrarloy: High-conductivity silver-copper alloy for commutator bars. Thos. Bolton & Sons, Widnes, England.

Comet: See Cromin.

Comet: High-nickel chrome iron alloys for dipping baskets rheostats, electrical controls. Driver-Harris Co., Harrison, N. J.

Comet: Coated Abrasives. Clover Mfg. Co., Norwalk, Conn.

Comet Exhaustair: Ventilating fans, unit heaters. New York Blower Co., 3163 S. Shields Ave., Chicago 16.

Comfo Caps: Protective caps for coal miners. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

Comfo Respirators: For protection against dusts, paints, metal fumes and mists. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh.

Commander: Platform trucks. Fairbanks Co., 395 Lafayette St., New York 3.

Comminutor: Automatically screens and cuts sewage solids under water, thus eliminating

screenings handling and disposal. Chicago Pump Co., 2300 Wolfram St., Chicago 18.

Commonwealth: One-piece cast steel devices for railroad locomotive and passenger cars. General Steel Castings Corp., Eddystone, Pa.

Comol: Permanent-magnet alloy containing 12 cobalt and 17 pct molybdenum; can be machined after first stage of heat treatment. Arnold Engineering Co., 147 E. Ontario St., Chicago 11.

Comol: Co-Mo-Fe permanent-magnet alloy with good machining and fabricating properties. General Electric Co., Schenectady 5.

Compact Loop Attachment: Improved method for fastening loops in the ends of wire rope and aircraft cable providing minimum size and weight. John A. Roebling's Sons Co., Trenton 2, N. J.

Comparoscope: Optical instrument to evaluate surface finishes, metal surfaces, grits, etc., against accepted standards. Compar-Instrument Co., 16179 Hamilton Ave., Detroit 3.

Compensated: Belting hose. Manhattan Rubber Div., 61 Willett St., Passaic, N. J.

Compo: Sintered, self-lubricating porous bronze with 10 Sn, 1.5 graphite for bearings and bushings. Bound Brook Oil-less Bearing Co., Bound Brook, N. J.

Compo-Bond: Acid-proof cement for bonding brick and tile. Ceilcote Co., 750 Rockefeller Bldg., Cleveland.

Compound Quenching Oil: Compounded light-bodied quenching oil for work requiring the use of a product containing additional "wetting" characteristics (not to be used with parts that are cooled with salts). Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80.

Computagram: Fan-type scale of high sensitivity. Toledo Scale Co., Toledo.

Computagram: Industrial scales. Toledo Scale Co., 1008 Telegraph Rd., Toledo 12.

Concrete Surface Treatment: Hardens new used concrete floors and prevents ruts and holes. Stonhard Co., 401 N. Broad St., Philadelphia 8.

Concretite: Smooth, hard, acid and grease-resistant concrete floors. Stonhard Co., 401 N. Broad St., Philadelphia 8.

Condit: Circuit breakers and motor starters. Allis-Chalmers Mfg. Co., Milwaukee 1.

Conde-Vac: Return-line vacuum and boiler-feed pump. Chicago Pump Co., 2300 Wolfram St., Chicago 18.

Condor: Belting, hose, tubing, asbestos brake blocks, rubber-covered rolls, molded rubber products. Manhattan Rubber Div., 61 Willett St., Passaic, N. J.

Condulets: Interchangeable plain and vapor-tight electric junction boxes, switches, receptacles, motor starters, etc. Crouse-Hinds Co., Syracuse 1, N. Y.

Cone: Automatic lathes. Cone Automatic Machine Co., Inc., Windsor, Vt.

Conemaugh: Barbed wire. Bethlehem Steel Co., Bethlehem.

Conomatic: Single or multiple-spindle automatic bar or chucking machine of horizontal spindle type. Cone Automatic Machine Co., Inc., Windsor, Vt.

Conpernik: Magnetic metal alloys. Westinghouse Electric Corp., East Pittsburgh, Pa.

Conservo: Quality rubber products for light industrial usage. Hewitt Rubber Corp., Buffalo 5.

Constructal: Aluminum alloys of complex composition for light alloy forgings, structural parts. Vereinigte Leichtmetall Werke, G.m.b.H., Hanover-Linden, Germany.

Continuous Flow: Conveyors. Beaumont Birch Co., 1507 Race St., Philadelphia 2.

Contraloy: 28-15 Cr-Ni stainless alloy for heat and corrosion-resistant parts. Michiana Products Corp., Route 12, Michigan City, Ind.

Contracid: Series of heat and corrosion resisting alloys with 12-18 Fe, 58-61 Ni, 15 Cr and Mo-Mn-W-Co; for chemical apparatus and surgical instruments. Heraeus-Vacuumschmelze A.G., Hanau, Germany.

Contour: For sharpening form-milling cutters on the periphery of the teeth. Cincinnati Milling Machine Co., Marburg Ave., Cincinnati.

Convertible: Steel shelving installations built up from a small number of interchangeable parts. Berger Mfg. Div., Republic Steel Corp., Canton 5, Ohio.

Cooper: Cr-Ni, Cr-Ni-Mo-Si and Cr-Ni-Mo steels for acid-resistant castings, pumps, valve fittings. Cooper Alloy Foundry Co., Elizabeth, N. J.

Cooper Stainless: Series of stainless steels and alloys up to 65 Ni for oil refineries, electric resistances and special applications in the chemical, paper and metals industries. Cooper Alloy Foundry Co., Elizabeth, N. J.

Copaloy: Babbitt for bearings. Michigan Smelting & Refining Co., 7893 Jos. Campau at Arnold, Detroit.

Copel: 55-45 copper nickel resistance alloy for electrical instruments, rheostats. Hoskins Mfg. Co., Lawton & Kinnison Aves., Detroit.

Copernick: 50-50 Fe-Ni alloy for transformer cores. Western Electric Co., S. Cicero & W. Cermak, Cicero, Chicago.

Copnic: Copper-nickel alloy. General Electric Co., Schenectady.

Copymaster: Photostat making equipment for office use. Victoray Corp., 245 E. 23rd St., New York 10.

Coolant-Klean: Filter to remove abrasive and metallic particles from grinder coolant. Cuno Engineering Corp., Meriden, Conn.

Coolant-Klean: See Micro-Klean.

Cooler: Cement coated nails. American Steel & Wire Co., Cleveland 13.

Cop-R-loy: Ingot iron containing small amount of copper for wire fencing, pipe, roofing tubes. Wheeling Steel Corp., Wheeling, W. Va.

Copel: Electrical resistance alloy of copper and nickel. Hoskins Mfg. Co., 4445 Lawton Ave., Detroit 8.

Cop-O-Top: Sheathing, waterproofing and dampproofing material consisting of laminated sheet copper and impregnated building paper. Chase Brass & Copper Co., Inc., Waterbury 91, Conn.

Copper Arc: Welding electrode for cast iron. C. E. Phillips & Co., 324 S. Jefferson Ave., Chicago.

Copper-Clad Steel: Steel with 10 to 20 pct copper cladding on one or both sides. For bearings, chemical apparatus and process equipment. Revere Copper & Brass, Inc., 43 Bright St., Rome, N. Y.

Copper-Clude: Seamless and welded steel pipes. Spang-Chalfant Div., Grant Bldg., Pittsburgh 30.

Copper Fluoborate: A high-speed acid copper electroplating solution. General Chemical Co., 40 Rector St., New York 6.

Copperior: Copper-bearing steel for roofing and culverts. Continental Steel Corp., Kokomo, Ind.

Copperoid: Copper-bearing steel products. Youngstown Sheet & Tube Co., Youngstown.

Copperoid Steel: Rust-resisting copper-bearing alloy steel sheets for construction purposes, automobile, furniture. Youngstown Sheet & Tube Co., Youngstown.

Cop-R-Loy: Copper-bearing steel sheets and pipe. Wheeling Steel Corp., Wheeling, W. Va.

Copr-Tube: Pipe fittings. Dresser Mfg. Co., Div. Bradford, Pa.

Copyflex Process: Photographic papers and machines for duplicating drawings, printed or typed material from opaque originals with copy on one both sides. Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41.

Corbin-Phillips: Patented cross-recessed head screws. Corbin Screw Div., American Hardware Corp., New Britain, Conn.

Corbin-Sems: Patented assembled lock washers and screws. Corbin Screw Div., American Hardware Corp., New Britain, Conn.

Cordo-Clad: Plastic-base, solvent-type, air-drying protective coating for metals. Merchants Chemical Co., Elm Court, Stamford, Conn.

Corekoat: Foundry core coating compounds. Independent Foundry Supply Co., 2325 E. 38th St., Los Angeles 11.

Coresin: Foundry core oils. Velsical Corp., 120 E. Pearson St., Chicago 11.

Corhart: Electrically melted and cast refractories composed of refractory oxides. See Electrocast. Corhart Refractories Co., Inc., 1600 W. Lee St., Louisville 10.

Corhart Electroblast: Ramming mix. Corhart Refractories Co., Inc., 1602 W. Lee St., Louisville 10.

Co-Res-Co: Spray, dip or brush-on liquid to protect ferrous metals against corrosion. Cordo Chemical Corp., 230 Park Ave., New York.

Corker: Cement coated nails. American Steel & Wire Co., Rockefeller Bldg., Cleveland 13.

Cornell: Cupola fluxes. Cleveland Flux Co., 1026 Main Ave., N.W., Cleveland 13.

Corol No. 623: Rust preventive compound, for indoor and outdoor protection of non-working exposed surfaces; dipped brushed or sprayed at 160° to 200°F. Simoniz Co., Industrial Div., 2112 S. Indiana Ave., Chicago 16.

Corol Nos. 625 and 671: Heavy waxlike and light grease-like rust preventatives respectively. Dipped, brushed or sprayed at 60° to 200°F. For ferrous or nonferrous metals. Simoniz Co., 2112 S. Indiana Ave., Chicago 16.

Corol Nos. 2100 and 2200: Lead-base rust preventatives. Dipped, brushed or sprayed at room temperatures. For ferrous or nonferrous metals. Simoniz Co., 2112 S. Indiana Ave., Chicago 16.

Corol Nos. 2300, 2400 and 2500: Oil lubricating, preservatives. For protecting equipment or engine parts. Simoniz Co., 2112 S. Indiana Ave., Chicago 16.

Corol Nos. 2600, 2700 and 2800: Rust preventatives, both light and heavy. Dipped, brushed or sprayed at room temperature. For ferrous and nonferrous parts. Simoniz Co., 2112 S. Indiana Ave., Chicago 16.

Co-Ro-Lite: Ready-to-mold industrial plastic compound reinforced by long, tough rope fibers. Columbian Rope Co., Inc., Auburn, N. Y.

Coronel: See Monel Metal.

Corosoloy: Corrosion resisting hard-surfacing electrodes. United States Steel Supply Co., 1319 W. Wabansia St., Chicago.

Corrofestal: Hardenable aluminum alloy with Mg, Si, Mn for light alloy parts in corrosive service. Deutsche Messingwerke, Berlin, Germany.

Corronize (ing): Composite electrodeposits of Ni-Zn, Ni-Sn, Ni-Cd, etc., thermally fused. High corrosion resistance as protective coating for steel wire, strip, etc. Standard Steel Spring Co., Coraopolis, Pa.

Corronizing: Corrosion-resistant finish of nickel and zinc electroplates with heat fusion at 700°F. Standard Steel Spring Co., Coraopolis, Pa.

Corrosiron: A 14 Si, 0.9 C, cast steel for acid pans, pumps, valves, condensers. Pacific Foundry Co., San Francisco; Bethlehem Foundry & Machine Co., Bethlehem, Pa.

Corrucrepe: Watercreped for bag, barrel, drum and box liners. Cincinnati Industries, Inc., Cincinnati (Lockland).

Corrulined Bag: Paperlined textile bag with plain or waterproof removable liner for products requiring protection against sifting and contamination. Cincinnati Industries, Inc., Cincinnati (Lockland).

Corsonite: Series of master alloys containing copper, nickel, cobalt, chrome, iron and silicon for making copper alloys. Union Carbide & Carbon Research Lab., Niagara Falls, N. Y.

Corstick: Adhesive supplied in solid form used for pasting cores in foundry operations. Midland Glue Products Co., 1478 Madison Ave., Detroit 7.

Cor-Ten: Low-alloy high-strength steel intended primarily for weight reduction by means of greater strength and enhanced atmospheric corrosion resistance; easily fabricated and welded. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30.

Corvic: Low-tin phosphor-bronze welding rod, for carbon-arc welding all types of copper using either "long-arc" or "short-arc." Chase Brass & Copper Co., Inc., Waterbury 91, Conn.

Corvic Bronze: A 1.5 Sn-Cu bronze for chemical engineering equipment. Chase Brass & Copper Co., Inc., Waterbury, Conn.

Cosmoline: Series of rust preventatives, which can be dipped, brushed or sprayed. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33.

Cottrell: Dust precipitators. Western Precipitation Corp., 1009 W. 9th St., Los Angeles.

Counterflow: Special design of dredging pump. American Manganese Steel Div., Chicago Heights, Ill.

Countrol: Operator protector devices and mechanical counter for punch presses. Veeder-Root, Inc., Hartford 2, Conn.

Crackseal: For sealing cracks and caulking around windows and floor frames and filling in brick joints. Stonhard Co., 401 N. Broad St., Philadelphia 8.

Cramp Superstrength: Copper alloy with Mn-Fe-Al for bushings, worms, bearings, valve bodies. Cramp Brass & Iron Foundries, 942 Simpson St., Eddystone, Pa.

Cramp's Bronze: Manganese bronze with 28 Zn and Mn-Fe-Al for bushings, bearings, gears, valve stems. Cramp Brass & Iron Foundries, Eddystone, Philadelphia.

Crane 18-8 Mo: Cr-Ni-Mo heat and abrasion-resistant steel for valves, fittings. Crane Co., 836 S. Michigan Ave., Chicago.

Crank-O-Lap: Crankshaft lapping machines. Norton Co., Worcester 6.

Crank-O-Matic: Crankshaft grinding machines. Norton Co., Worcester 6.

Crescent: Conveyor chains. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Crescent: High heat duty fireclay brick. North American Refractories Co., 1012 National City Bank Bldg., Cleveland 14.

Cresta: Arcwelding electrode for steel; corresponds to AWS E-6030. Metal & Thermit Corp., 120 Broadway, New York 5.

Crilley Metals: Hg-bearing bronze for bearings, Bohn Aluminum & Brass Corp., Lafayette Bldg., Detroit.

Crodon: Cr-Fe electroplating alloy for anodes in electrolytic copper cells. Chromium Corp. of America, 348 Huntingdon Ave., Waterbury, Conn.

Croloy: Carbon-molybdenum steel faced with welded-on stainless steel. Can be hot formed, spun or welded. H. Disston & Sons, Inc., 4334 Tacony, Philadelphia.

Croloy: Cr-Mo-Si-Mn, and Mn-Cr-Mo steels for tubing in high temperature use and oil refinery equipment. Babcock & Wilcox Tube Co., Beaver Falls, Pa.

Croloy 7: 0.15 C, 0.50 Mn, 0.030 P, 0.030 S, 0.50 to 1.00 Si, 6.50 to 7.50 Cr, 0.45 to 0.65 Mo steel. High corrosion and oxidation resistance. For oil refinery cracking-still tubes and steam superheaters. H. Disston & Sons Co., Inc., 4334 Tacony, Philadelphia.

Croma: Cr-Mn steel for machinery parts. Lehigh Steel Co., 16 Bethune St., New York.

Cromaloy: 61-20 Ni-Fe alloy with 15 Cr, 4 Mn for electric heating devices. A. C. Scott & Co., Ltd., Manchester, England.

Cromaloy: Corrosion and heat-resistant 21 Cr, 2 Si, iron for corrosion and heat resisting parts. Midvale Co., Nicetown, Philadelphia.

Cromaloy: Flux for welding stainless and all chromium-containing alloy steels. Linde Air Products Co., 30 E. 42nd St., New York 17.

Cromic: Series of high chrome, high nickel-iron alloy wires for heat and corrosion resistance. Geo. W. Prentiss & Co., 145 Front St., Holyoke, Mass.

Cromimphy: 13 Cr steel for stainless applications in food handling equipment, kitchenware, turbine blades. Soc. Anon. de Commentry Fourchambault et Decazeville, Paris, France; R. Y. Ferner, Investment Bldg., Washington.

Chromansil: Series of low-alloy steels with Cr-Mn-Si for boilers, ship plates, tubing, gears. Electro-Metallurgical Co., 30 E. 42nd St., New York.

Cromin D: Nickel-bearing iron alloy for low temperature work, motor starters, fans. Wilbur B. Driver Co., Newark, N. J.

Cromodine: Chemicals for use in a spray or immersion process for improving paint life and adhesion on ferrous metals. American Chemical Paint Co., Ambler, Pa.

Cromonite: Alloy steel for chill rolls. Continental Roll & Steel Foundry Co., E. Chicago, Ind.

Cronak: Process for the pacification of zinc and zinc coated surfaces. New Jersey Zinc Co., 160 Front St., New York 7.

Cronite: Complex nickel-iron-chrome alloy for carburizing boxes, furnace parts, resistances. Cronite Foundry Co., Tottenham, London, England.

Cro-Sil: 10 Cr, 3 Si, low-carbon stainless steel for corrosion-resistant parts. Crucible Steel Co. of America, Chrysler Bldg., New York.

Crotorite: Aluminum bronzes in bars, tubes and sections. Manganese Bronze & Brass Co., Ltd., Ipswich, England.

Croterite: Copper alloys with aluminum or Ni-Al-Mn for corrosion resistance in paper mills, turbines, gears. Manganese Bronze & Brass Co., Ltd., London, England.

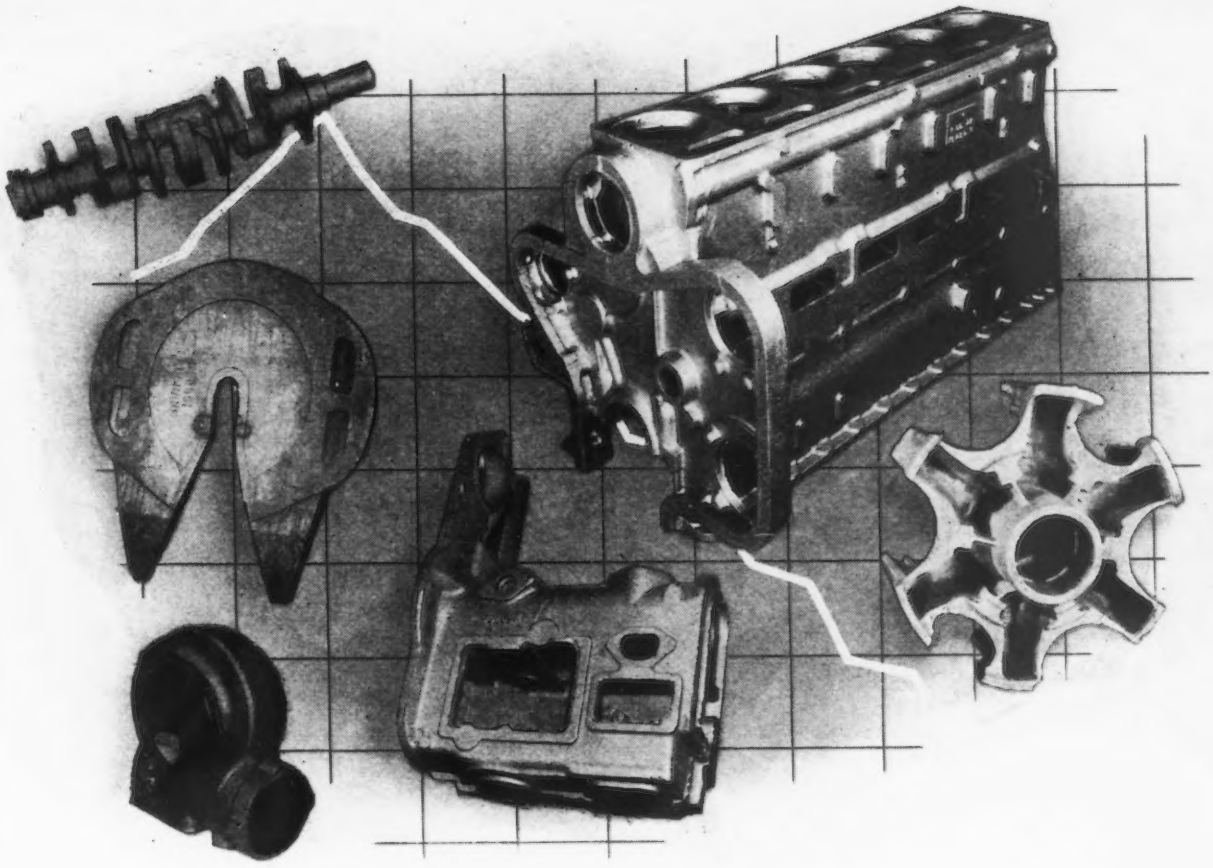
Crotorite: Corrosion-resistant copper alloy for paper mill machinery and heating elements. Manganese Bronze & Brass Co., Ltd., London, England.

Crown: Firebrick. Laclede-Christy Clay Products Co., Ambassador Bldg., St. Louis 1.

Crown: Galvanizing salts. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Crown: Rail bonds, music wire. American Steel & Wire Co., Cleveland 13.

Crown: Series of bronzes for bearings, pumps, engine castings. A. Cohn, Ltd., London, England.



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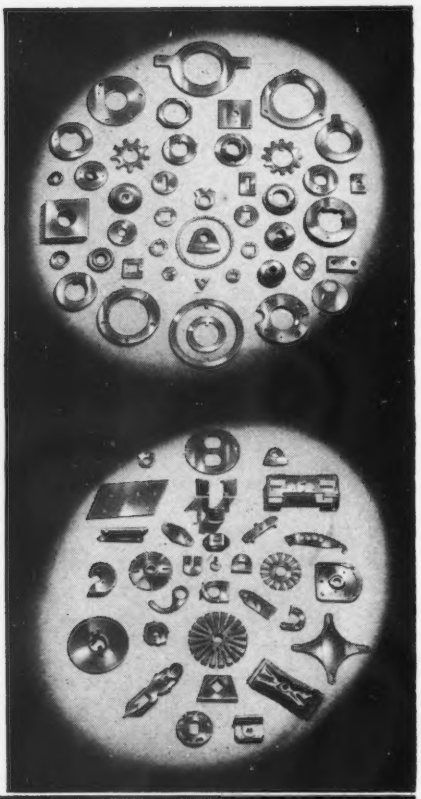

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10,000 TRADE NAMES

Crown: Temperature bonding mortar. Robinson Clay Products Co., Akron 9, Ohio.

Crown K: Scratch brush and heddle wire. American Steel & Wire Co., Cleveland 13.

Crown Spray: Spray guns and spray painting equipment. American Brake Shoe Co., 230 Park Ave., New York 17.

Crucible Weld: Series of electric welding electrodes for low and medium-carbon steels. Westinghouse Electric Corp., East Pittsburgh.

Cryscoat: Cleaning conditioner for preparing ferrous products for painting or organic finishing. Oakite Products, Inc., 20 Thames St., New York 6

Crystalite: See Remmey.

Crystal Silica: Washed-dried and screened white silica sand for cores and molds. Ottawa Silica Co., Ottawa, Ill.

Crystallex: Industrial radiograph film. Kodak, Ltd., Kingsway, London, W. C. 2, England.

Crystalux: Luminaires. Westinghouse Electric Corp., East Pittsburgh, Pa.

Crystolon: Silicon-carbide products such as abrasive grain, bonded abrasive wheels and products, and refractory products. Norton Co., Worcester 6.

Cub: Portable loaders. Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6.

Cuferco: Metal with high electrical conductivity and tensile strength. Used for spot welding tips. Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

Cu-Lead-Ite: Series of copper-lead alloys, also with tin, for nuts, bearings, piston packing. Scientific Alloys Inc., Los Angeles.

Cumanite: Special grades of manganese steel. American Manganese Steel Div., Chicago Heights, Ill.

Cumberland: Turned and ground shafts. Cumberland Steel Co., Cumberland, Md.

Cumloy: See West.

Cunic: 45-55 nickel-copper alloy for rheostats, shunts, thermocouples. Geo. W. Prentiss & Co., 145 Front St., Holyoke, Mass.

Cunico: Cu-Ni-Co permanent-magnet alloy which is ductile, malleable and machinable. General Electric Co., Schenectady 5; Arnold Engineering Co., 147 E. Ontario St., Chicago 11.

Cunife: 60 Cu, 20 Fe and 20 Ni permanent-magnet alloy. Arnold Engineering Co., 147 E. Ontario St., Chicago 11.

Cunife: Cu-Ni-Fe age-hardening permanent-magnet alloy which is malleable, ductile and machinable. General Electric Co., Schenectady 5.

Cupaloy: High-conductivity copper-chrome alloys for commutators, slip rings. Westinghouse Electric Corp., East Pittsburgh.

Cupaloy: Alloy metals. Westinghouse Electric Corp., East Pittsburgh, Pa.

Cupola Blocks: Fire brick. Robinson Clay Products Co., Akron 9, Ohio.

Cupola-Patch: Dry refractory mix which is made plastic by addition of water and is used in the foundry for cupola patching.

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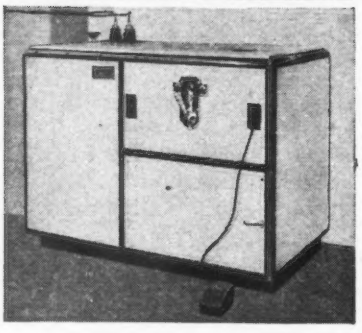

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spouts, breasts, wells and melting zones and for lining smaller ladles. Ramtite Co., 2562 W. 18th St., Chicago 8.

Cupro-Arc: See Arcaloy.

Cupro-Arc C: Phosphor-bronze electrode recommended for welding bronze, brass, copper, high-carbon steel, cast and malleable iron. Alloy Rods Co., York, Pa.

Cuprodine: Powdered chemical which, when dissolved in dilute sulfuric acid, forms a solution which produces adherent, bright copper coatings on steel surfaces by simple immersion without use of electric current that will effectively improve die life in the drawing of steel objects. American Chemical Paint Co., Ambler, Pa.

Cupron: 55-45 Cu-Ni for rheostats, vault meters, shanks. Wilbur B. Driver Co., Newark, N. J.

Cupro-Nickel: 70 Cu, 30 Ni alloy available as tubing for condenser tubes. High corrosion resistance. Wolverine Tube Div., 1467 Central Ave., Detroit 9.

Cuprotek No. 2: Liquid chemical which, when diluted with water, forms a solution that imparts to copper, brass or Cuprodized steel surfaces greatly increased corrosion resistance. American Chemical Paint Co., Ambler, Pa.

Cuprotex: Liquid chemical which, when diluted with water, forms a solution which imparts to copper, brass, or Cuprodized surfaces greatly increased corrosion resistance. American Chemical Paint Co., Ambler, Pa.

Cureloy: Steel used for rolls for ferrous and nonferrous rolling mills. Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

Cut-Aid: Compounded cutting fluid for machining aluminum, magnesium, and other nonferrous metals; also energizer for other cutting oils regardless of type or viscosity. Gulf Oil Corp., Gulf Bldg., Pittsburgh.

Cutanite: See Titanit.

Cutanite: Cemented-carbide cutting tools. William Jessop & Sons, Ltd., Sheffield, England.

Cut Master: Vertical turret lathes. Bullard Co., Bridgeport 2, Conn.

Cutmax: Cutting fluids and bases for every condition where straight cutting oils are preferred. Sulphurized, E.P. treated or both, or available without either type of treatment. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33.

Cuyo: Stainless and heat resisting steel for furnace parts. Cuyahoga Steel & Wire Co., Newburg P. O. Box 1770, Cleveland.

Cuzinal: Brass with 2.1 Al, 0.03 As for condenser and heat exchangers. Bridgeport Brass Co., Bridgeport, Conn.

CVAC Treatment: Alkaline-electrolyte anodic treatment of magnesium-alloy parts for protection and paint base. American Magnesium Corp., 2210 Harvard St., Cleveland.

Cyanegg: White solid fused in 1-oz eggs and in granular form; for heat treating steel; in electroplating; in cleaning of metal, including neutralizing after pickling; and in the extraction of gold, silver, zinc and lead from ores. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

(To Be Continued)